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See Page 65

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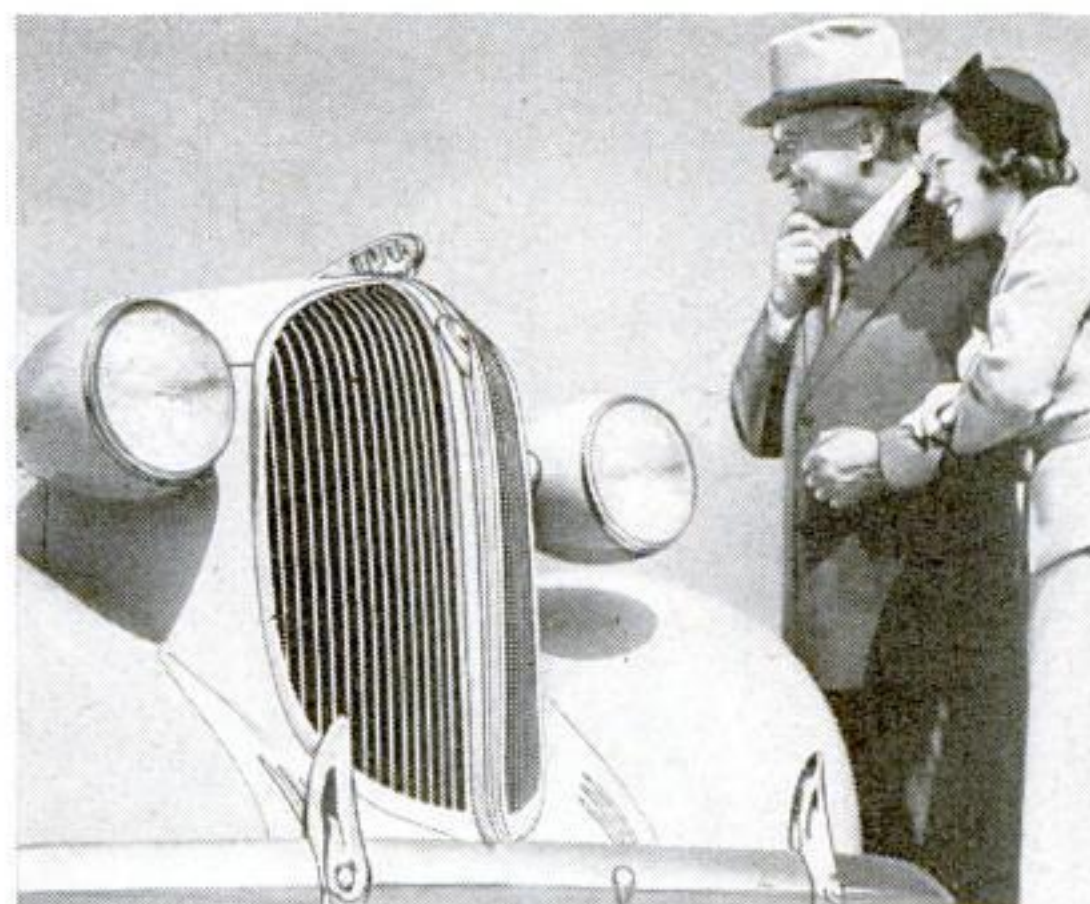
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2 See How Easy it is to adjust the front seat. It rises as it moves forward.



3 This is News, Too! Instruments are easier to read...and the hand-brake is out of the floor and under the panel.



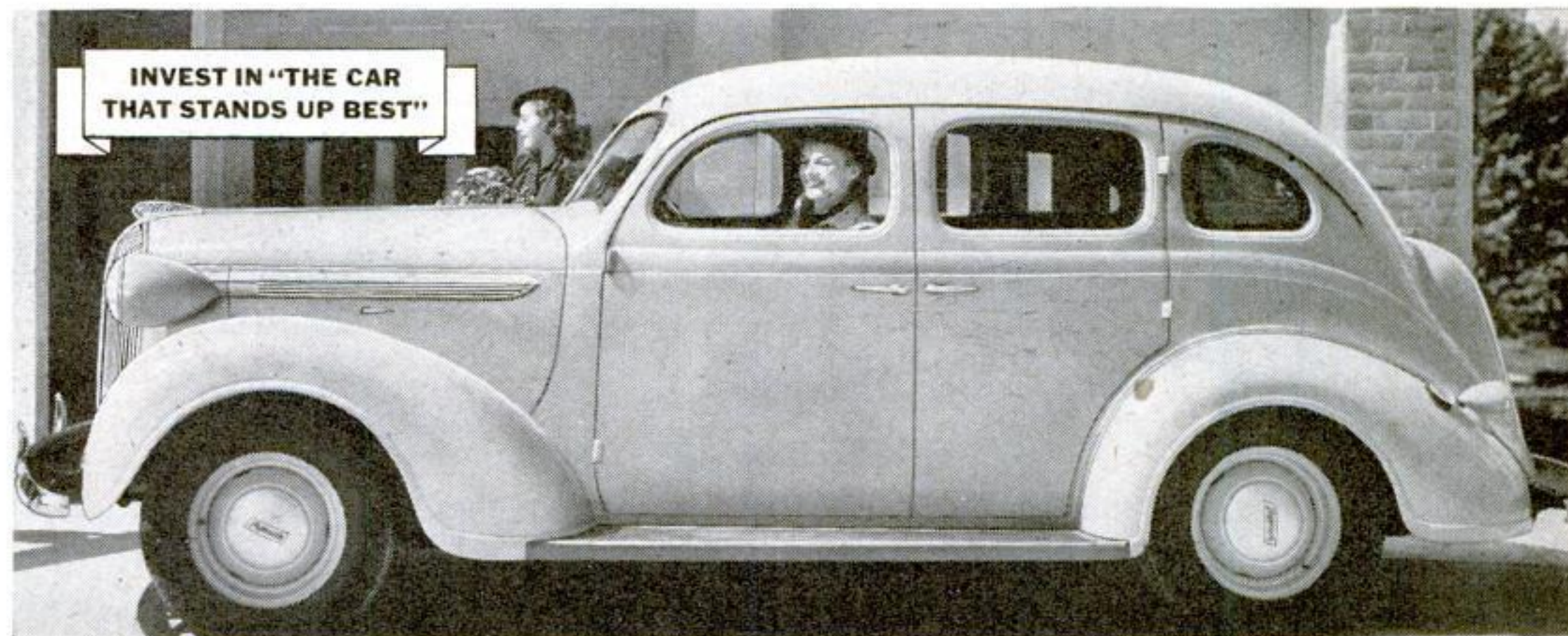
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6 Look at the Trunk! Besides the tremendous extra room, it is fabric-lined!



7 Isn't it a Beauty? The New 1938 Plymouth! The only low-priced car with Floating Power engine mountings...double-action hydraulic brakes

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Published monthly at 353 Fourth Avenue, New York, N. Y., by Popular Science Publishing Co., Inc. A. L. Cole, President and Treasurer; R. C. Wilson, Vice President; John Nichols, Vice President; C. D. Freeman, Vice President; F. W. Briggs, Secretary. Entered as second-class matter Dec. 28, 1918, at the Post Office at New York under the act of March 3, 1879; additional entry as second-class matter at Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U. S. A. Copyright, 1937, by Popular Science Publishing Co., Inc. Single copy, 15 cents. Yearly subscriptions to United States, its possessions, and Canada, \$1.50; foreign countries, excepting Canada, \$2. Subscribers must notify us

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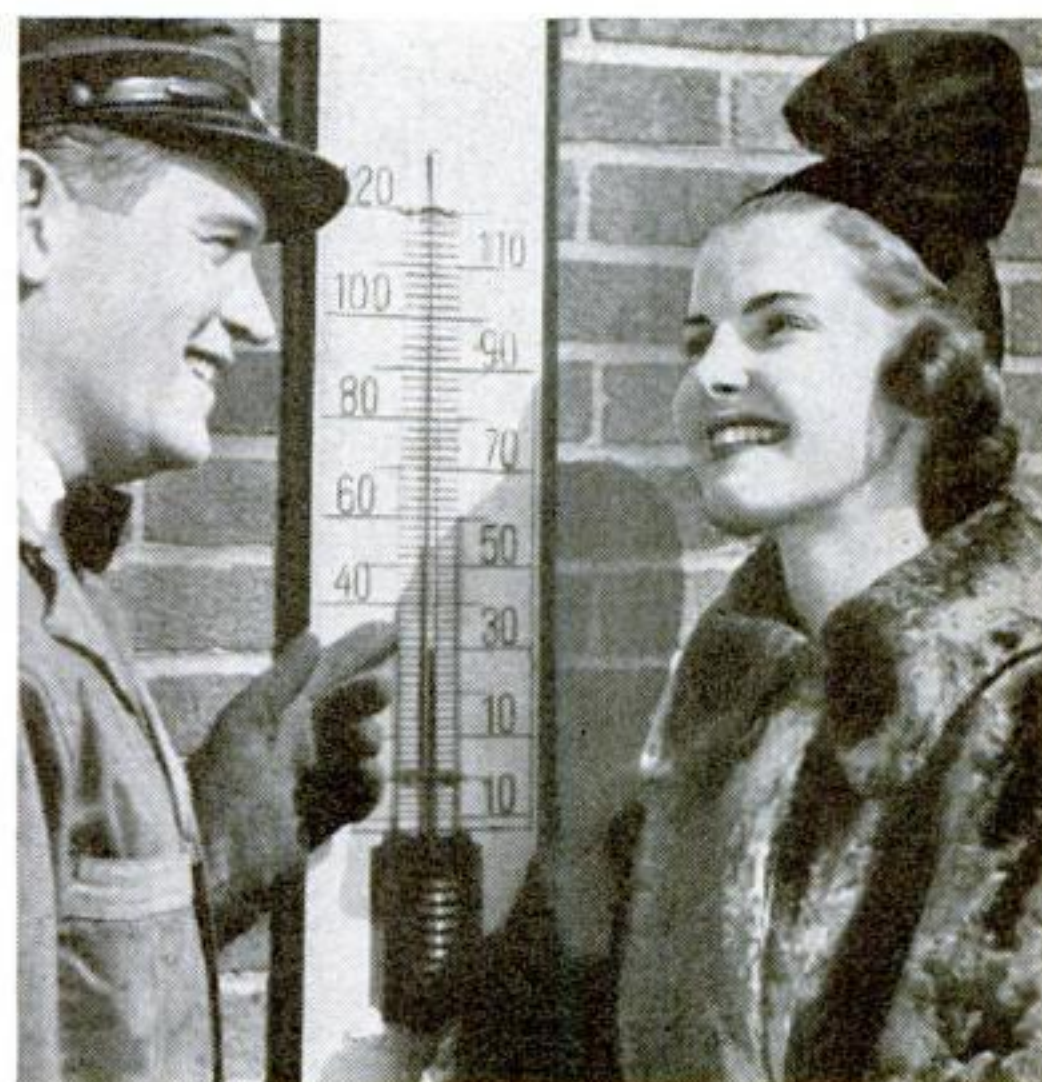
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Our Readers Say



Claims Stone Xylophone Is In Grandfather's Home

IN A RECENT letter from W.A.M., Elmira, N.Y., in Our Readers Say, reference is made to a concert company which played in his home town some forty years ago, using as their main attraction a xylophonelike instrument composed of rocks. I have reason to believe that this instrument is the one that now is in the attic of my grandfather's house in East Orange, N.J. W.A.M.'s description fits the instrument closely, especially where he mentions that four persons played it. I know of only one other such instrument. It is in the Metropolitan Museum of Art, New York City. It was presented by my grandfather to the essayist, John Ruskin. My grandfather has the original letter of thanks from Ruskin, and a copy of it is displayed with the museum piece.—J.T.C., East Orange, N. J.

I'VE BEEN PLAYIN' STONE MUSIC FOR YEARS!



And Here's a Problem in Footballistics

Now that we have with us again the flying pigskins filled with air and the sitting coonskins filled with whisky, suppose we give the footballistic experts a stimulant on which to whet their wits instead of wetting their whistles. George Gipp of Notre Dame once once kicked a field goal from a point halfway between the side lines and sixty-two yards from the opponents' goal. The ball grazed the bar, set ten feet above the goal line, and landed ten yards beyond. Assuming there was no wind blowing, how high did he kick the ball?—S.A.M., Sykesville, Md.

Only One Way to Go From the North Pole

BEING only human, I cannot convince a woman against her will. The fact is that I have just emerged from a lively but fruitless argument with a woman whom I failed to convince of the following: At the north pole there is only one direction along the earth's surface, and that is south. The argument arose from that fine article in your September issue, "Race for the Skyways," in which it was stated that the Russian flyers headed eastward from the pole. I can't agree with the contention. Wonder if any of your readers could help me by giving a short, logical explanation of why there is no north, east, nor west at the north pole.—H.S.S., Timmins, Ontario.



It Would Be a Good Way To Eliminate Speeding

IN A test published recently in a national magazine the following question was asked: "If friction could be entirely eliminated, how far would a car travel on a gallon of gasoline?" The answer given on another page stated that because of the fact that the lack of friction would eliminate traction, the car would not move at all. This seems like jumping at conclusions to me. How about molecular attraction, the strange force that holds two gauge blocks together? The slightest bit of attraction between the rubber of the tires and the road would cause the car to move perceptibly. I'd be interested to hear what some of your other readers think.—H.J.W., New York, N. Y.

When Wailes Meets Walling, It's Microchemistry

YOUR MAGAZINE is improving every issue, and I get a great deal of information and pleasure out of it. The articles on chemistry and microscopy are particularly interesting. It occurred to me that if Raymond B. Wailes and Morton C. Walling got together they could give us an article on microchemistry. It is suited to amateur experimenting, requiring little money.—R.A., Lincoln, Nebr.

MICRO-AUTO-HOME-WORKSHOP-RADIO-PHOTO-CHEMISTRY, NOW THAT'S SOMETHIN'!



Two "Bi-Vocals" Heard From; Do They Make One Quartet?

MANY MOONS ago a letter appeared in Our Readers Say describing the letter writer's ability to whistle and hum at the same time. When I was a boy, I too discovered the possibility of this combination. However, I carried it a little further. I found that the two "voices" can be directed independently of each other; that is, the melody can be whistled while a counter melody can be hummed. I have found it convenient in working out inspirations away from a piano. Other "bi-vocals" might be interested in experimenting in this field.—W.W.H., Woodlynne, N. J.

Thinks Uncle Sam Should Foot the Inventors' Bills

ALMOST every one is an inventor of sorts, although many fail to realize it because they are not encouraged. What better encouragement could be offered than free patents, minus the many incidental expenses and fees? At present, it seems to me that the Government makes it pretty difficult for an inventor to protect his idea and make it available

to the public. Every one benefits when a new item is created, or an improvement is made on an old one, so why shouldn't Uncle Sam foot the bill for practical ideas?—A.L., Readville, Mass.

The Novel Pipe on Page 64 May Answer This Question

THIS IS NOT a particularly pretty subject, but one that any veteran pipe smoker should be interested in. Every pipe chewer knows that he must clean his pet "stoves" from time to time. Still, this task could be made less frequent and more pleasant if some one would only construct a pipe stem to trap the saliva in the bit, rather than in the shank. It is a common mistake to think that this sole unpleasantness of pipe smoking is unavoidable. Why couldn't a pipe bit be made with a tubular reservoir below the smoke passage into which saliva could drain through a hole of adequate size? The reservoir could then be emptied occasionally.—D.R.R., Montclair, N. J.

LIKE THIS?



More Light on the Subject of How We See

B.T.L. CLAIMS that we do not see the stars, only their reflected light; and R.D.J. claims we do not see *any* object, only reflected light. Now is it not true that, according to our present atomic theory, light is caused by the changing orbits of the planetary electrons of the atom? This being true, would we not see the stars and certain other objects, of which these atoms are parts? And should we not then say that *almost* all objects are seen by reflected light, but such things as the stars, the sun, lighted filaments, and flames are seen by direct light?—W.L.B., Yucaipa, Calif.

Take Your Time in Figuring This Out

WEDDING BELLS rang out in Batavia, Java, Dutch East Indies, some weeks ago for a bridegroom whose real bride was at the time some 8,000 miles away in Grand Rapids, Mich. The lucky man heard the vows of another woman, or proxy, taking part in the ceremony in place of his bride, after the manner of a movie double. The procedure is said to be legal under Netherlands law, and the bride has left Grand Rapids for (Continued on page 8)

GO NATIVE AND WHO CARES?





I jumped from \$18 a week to \$50
-- a Free Book started me toward this
GOOD PAY IN RADIO

HERE'S
How it
Happened
 by S. J. E.
 (NAME AND ADDRESS
 SENT UPON REQUEST)



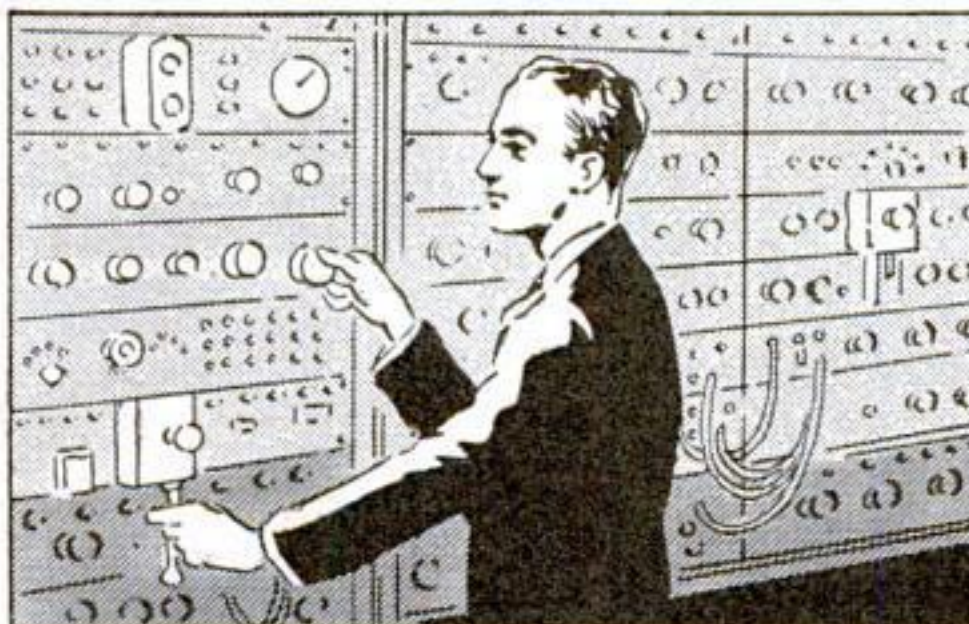
"I had an \$18 a week job in a shoe factory. I'd probably be at it today if I hadn't read about the opportunities in Radio and started training at home for them."



"The training National Radio Institute gave me was so practical I was soon ready to make \$5, \$10, \$15 a week in spare time servicing Radio sets."



"When I finished training I accepted a job as serviceman with a Radio store. In three weeks I was made service manager at more than twice what I earned in the shoe factory."



"Eight months later N. R. I. Employment Department sent me to Station KWCR as a Radio operator. Now I am Radio Engineer at Station WSUI. I am also connected with Television Station W9XK."



"N. R. I. Training took me out of a low-pay shoe factory job and put me into Radio at good pay. Radio is growing fast. The field is wide open to properly trained men."



J. E. SMITH, President
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 \$75 a Week**

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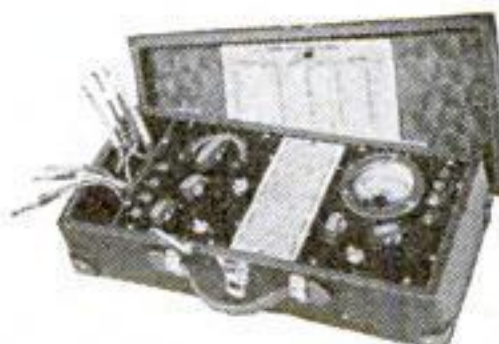
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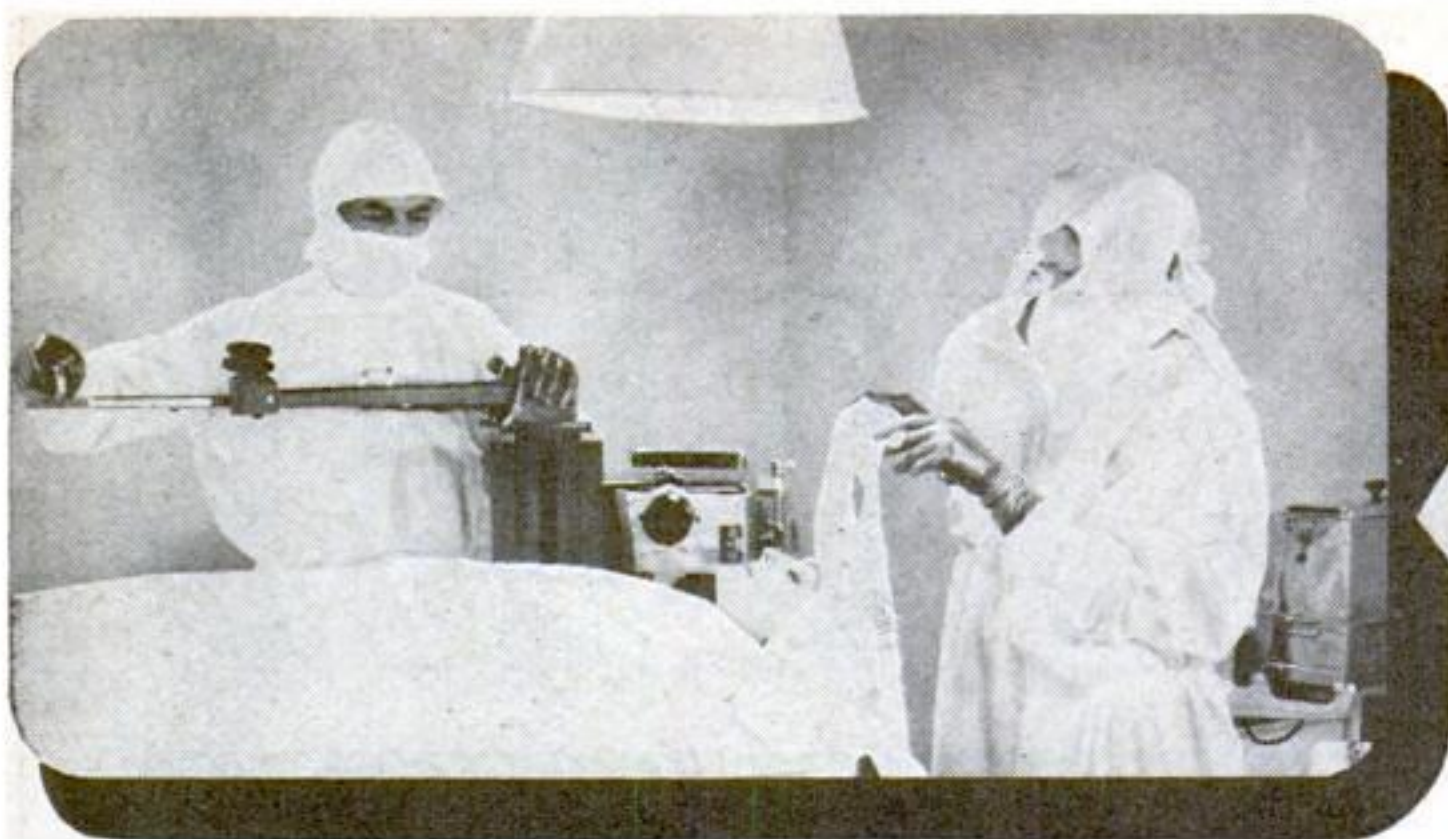
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Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out spare time and full time opportunities in Radio, and explains your practical method of training at home in spare time to become a Radio Expert. (Please write plainly).

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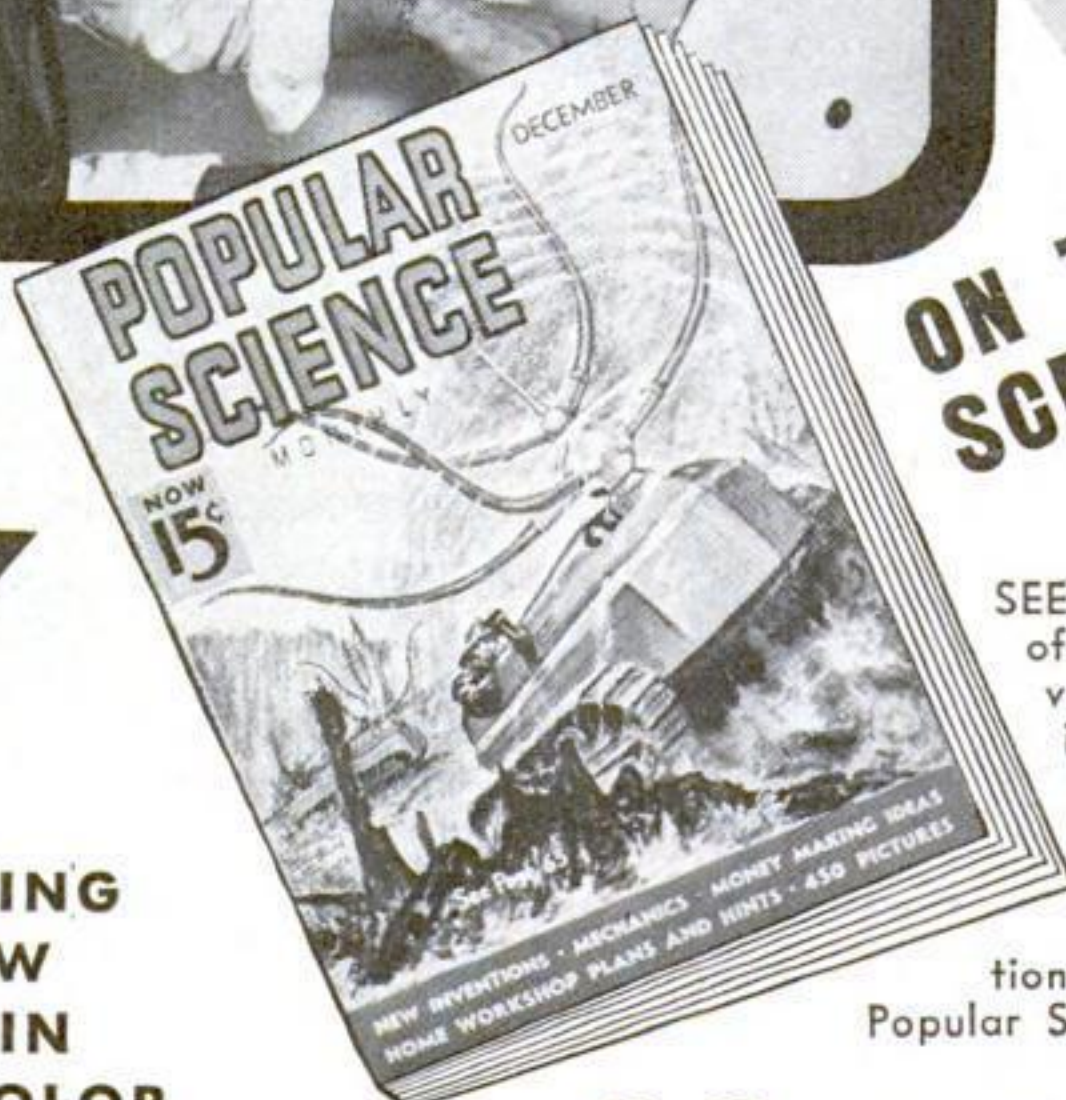
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A Paramount Picture

Our Readers Say

(Continued from page 6)

Java to join her husband whom she has not seen in nearly a year. What I want to know is, will the couple be able to celebrate their wedding anniversary (anniversaries?) on the same date in view of the fact that they were on opposite sides of the International Date Line when the ceremony occurred? According to my calculations, they were thirteen and a half hours apart on the international time map, and when the bride reaches Java, her anniversary will not correspond with her husband's.—M.I.J., Atlanta, Ga.

This Math Shark Believes in Sparing the Pencil

OPENING my October issue of your magazine, I followed my usual procedure of turning to Our Readers Say first. If all the suggestions of readers were carried out, your magazine would have to be published daily instead of monthly, but you're doing a fine job. The little problem from H.S. turned out to be just as simple as he predicted. Referring to the lettering of the diagram; construct diagonal OC. Then OC equals AB equals five inches. But OC and OE are radii of the same circle, hence equal. Therefore OA equals OE minus AE, or three inches. It took me just three minutes to solve the problem.—D.M.P., Newmarket, N. H.

ASK ME ANOTHER!



Suggests Automatic "Ears" On Ship's Sound Detector

YOUR cover pictures display practical ideas, but I believe an improvement could be made on the directional sound detector shown on the September cover. The device picks up sounds with two collectors spaced a few feet apart, and conducts them to the operator's ears. But it depends on human ears of identical sensitivity. A better application might be to place large, sensitive microphones on each side of a ship. An electrical device could then equalize the sounds, indicating the process on a dial showing degrees to port or starboard. This would be of far greater accuracy than human ears, and eliminate the human element.—A.D.W., Denver, Colo.

The Lady of the House Gives Us a Big Boost

SO MANY women like myself probably read your magazine and write to the editor that this letter undoubtedly will go in your scrapbasket, but here's my story. My husband's interest in your magazine piqued my curiosity so much that I examined it carefully one night, and hereafter I will read it as eagerly as he does. It all started when he told me he was going to build



(Continued on page 9)

(Continued from page 8)

the doll house described in your October issue, as a Christmas present for our little girl. The house is just about finished, and so are its decorations and trimmings, for which I have assumed responsibility myself. I'd like to see more features like "Marionettes Go Hollywood." I thought perhaps you would be interested in this expression from a woman reader.—J.D.L., Wilmington, Del.

Wants to Find Lost Treasure —And Don't We All?

TREASURE HUNTING is probably a subject that appeals to everybody, but it appeals particularly to me because when I was a boy my grandfather told me there was a buried treasure on his father's property. He said he did not know the exact location of the treasure. I once dug for it but found only scrap iron. I would appreciate it if you would print an article on how to find a treasure such as this, and what equipment I would need to look for it. I would like to see the article describe the various divining rods that are supposed to locate hidden minerals and metals, and tell whether such devices are really effective. I have heard that those employing radio principles are best. On the other hand I have heard that marvelous discoveries of hidden wealth have resulted from use of searching devices of crude, unscientific construction.—A.S.T., Norfolk, Va.

PICK'N SHOVEL,
GRUB AND LOTS OF
PATIENCE!



Sounds Like an Overgrown Microscope Dipping Tube

WHY couldn't scientists construct a six-foot hollow ball with heavy viewing windows to be lowered to great ocean depths? A trapdoor beneath the ball would allow specimens of deep-sea life to be sucked into the ball by a hose at the top. A filter would keep the specimens from being drawn up through the hose. The trapdoor could then be closed mechanically at the same time that a valve is closed at the hose connection. Automatic valves could, as the ball was raised, maintain interior pressure equal to that at which the vents were closed, thus preserving the specimen life within. The specimens then would live and could be studied at the surface as long as the pressure was maintained. An interesting experiment would be to observe evolution at first hand. For this, the tank pressure could be reduced gradually, until it was the same as atmospheric pressure.—H.V.L., Roanoke, Va.

Motorist Discovers A Trick To See Carburetor At Work

Most motorists are familiar with the various parts of their cars, but I wonder how many really know what goes on inside the carburetor. I recently removed the air cleaner on top of my carburetor to give it its regular scouring, and in doing so I could see down the intake passage. It occurred to me to start the motor and take another look. I was astonished to find that I could actually see the gasoline being mixed with air. Accelerating the engine by pushing the

(Continued on page 10)

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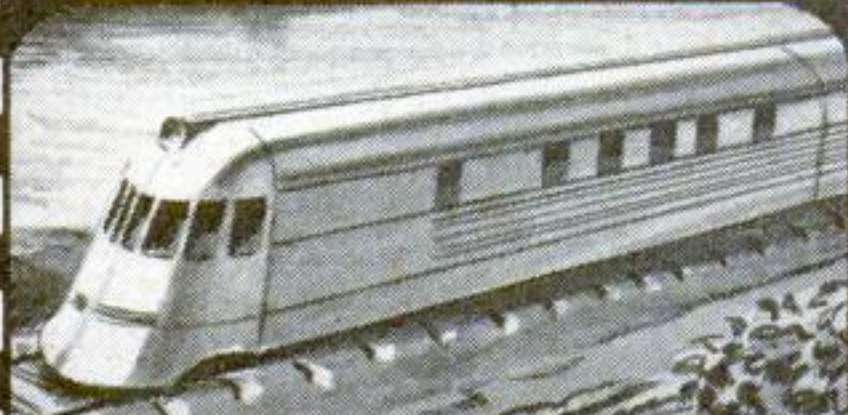
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NEWS SHOTS FOR MOTORISTS

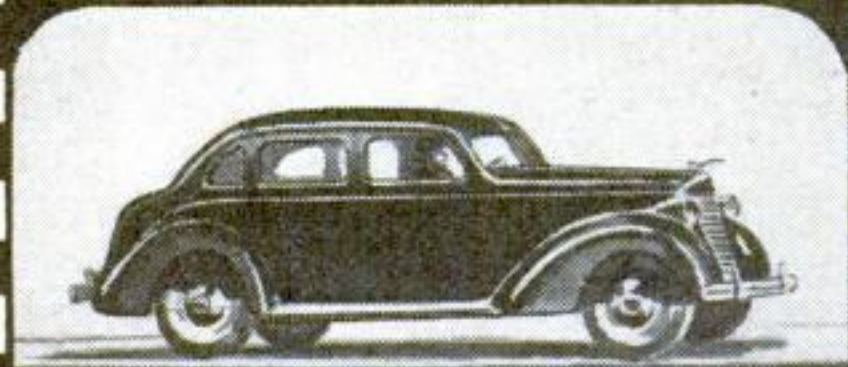
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(Continued from page 9)

throttle rod showed me how an extra quantity of gasoline is injected during this operation by the acceleration pump. Manipulating the choke demonstrated how more gasoline is sucked into the manifold by cutting down the supply of air.—A.J.S., Toledo, Ohio.

Chinese Says 'Phone Poles Buzz, Wants To Know The Reason

HAVING READ your interesting magazine for more than four years, always enjoying the questions, comments, and sundry novelties set forth, particularly in Our Readers Say, I would like to offer this poser: What causes the humming sound in telegraph and telephone poles? I have heard that no one has been able to give a satisfactory answer to this problem. It is particularly noticeable when you put your ear against a pole.—J.G.L., Hangchow, China.



Now F. A. C. Better Watch Out For His Own Neck

LITERALISTS will probably be on your neck again over the statement in F.C.P.'s letter in your October issue that his new car is "so darn quiet that every time a bumblebee hits the windshield it sounds like an explosion." They'll be saying that what he really meant was "every time the car's windshield hits a bumblebee..." We've heard a lot of these teasers lately: How far away is your image in a mirror? Do you walk past a fellow walking in the opposite direction, or does he walk past you? Does the rim of a wheel of a moving train stand still momentarily at the point where it touches the track? Do we actually see an object, or just its reflected light? Does an automobile motor pull or push the vehicle, and how far is up? If simple logic can't resolve these questions let's call the whole thing off.—F.A.C., Albuquerque, N. Mex.

His Camera Can Take It—And We Don't Mean a Picture!

HAVING READ your article, "How Tough Is Your Camera?" in the October issue, I was inspired to write you about how tough mine is. It is a folding camera of German make. I lent it recently to a friend who is a professional parachute jumper, to take some aerial pictures. Ascending to nearly a mile in a hot-air balloon with my camera, he was just getting ready to take some pictures when he accidentally dropped it. Although it fell for more than 4,000 feet, dug out a hole, and buried itself in hard ground to a depth of about three inches, when I finally recovered it there was not a scratch nor a dent to be found on it. What's more, it still took pictures as well as ever. Truly, I was amazed. However, I don't advise anyone to try the test, as his camera might hit a rock.—R.D.W., Batavia, N. Y.



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1 Rich red blood, necessary to properly nourish and build up every part of the body, is especially promoted by this new discovery where iron is needed.

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NOW thousands of skinny, rundown men and women can say goodbye to bony angles and unsightly hollows that rob them of natural attractiveness. For with this new easy 3-way treatment, hosts of people who never could gain an ounce before have put on pounds of solid, normally good-looking flesh—in just a few weeks!

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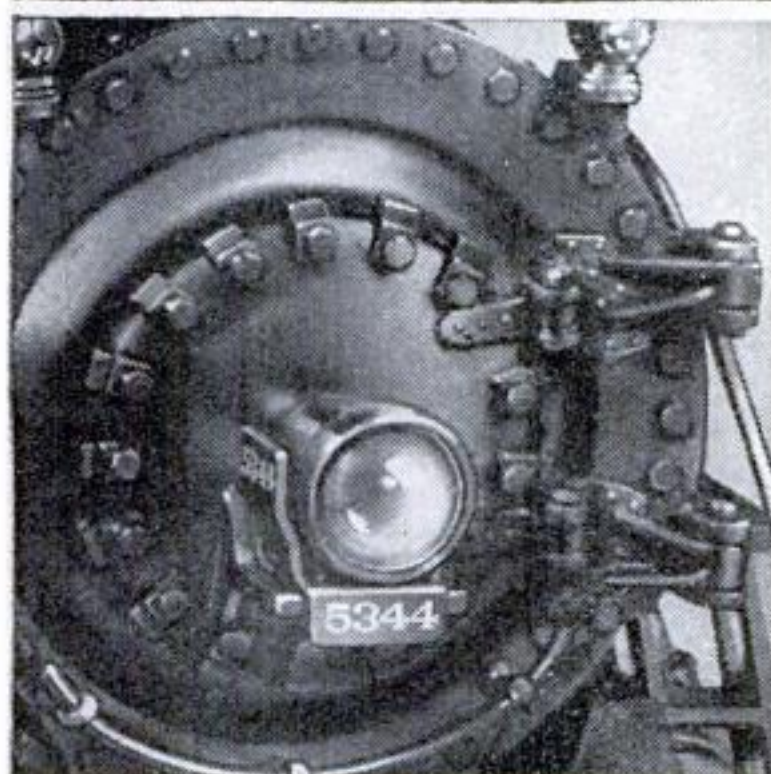
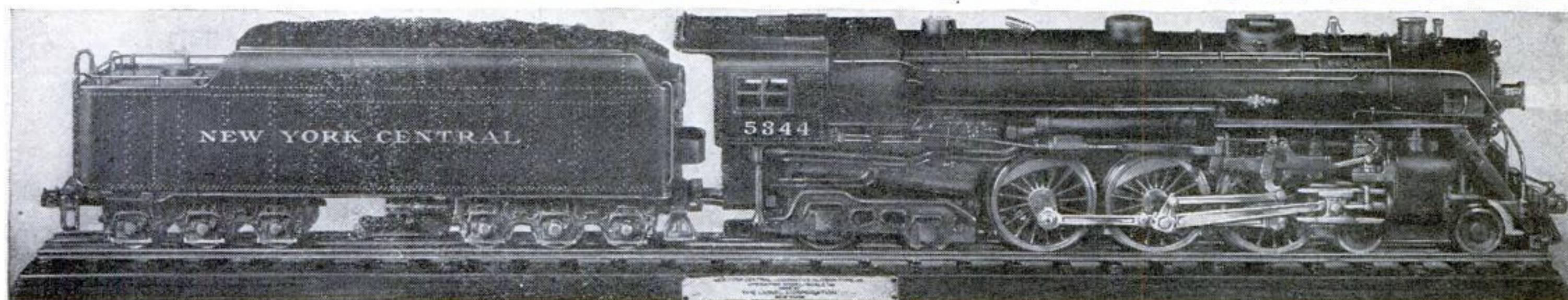
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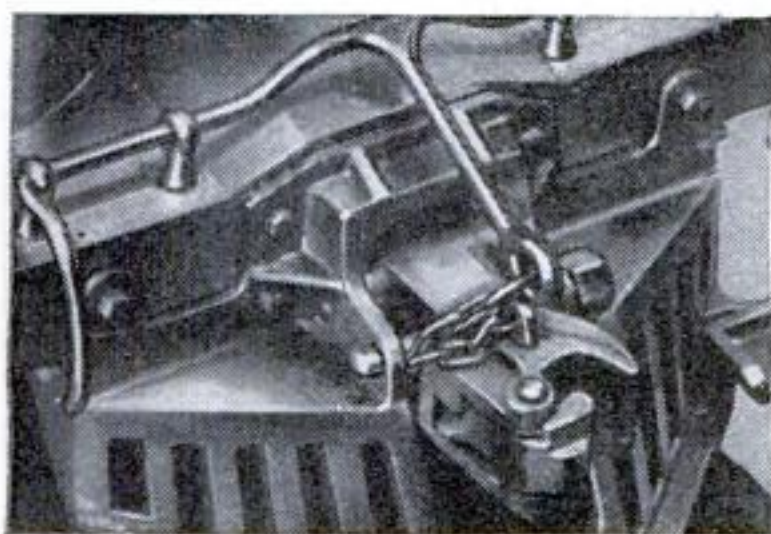
"Bill, nothing beats building a railroad system—makes you feel like a pioneer"
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*Start a
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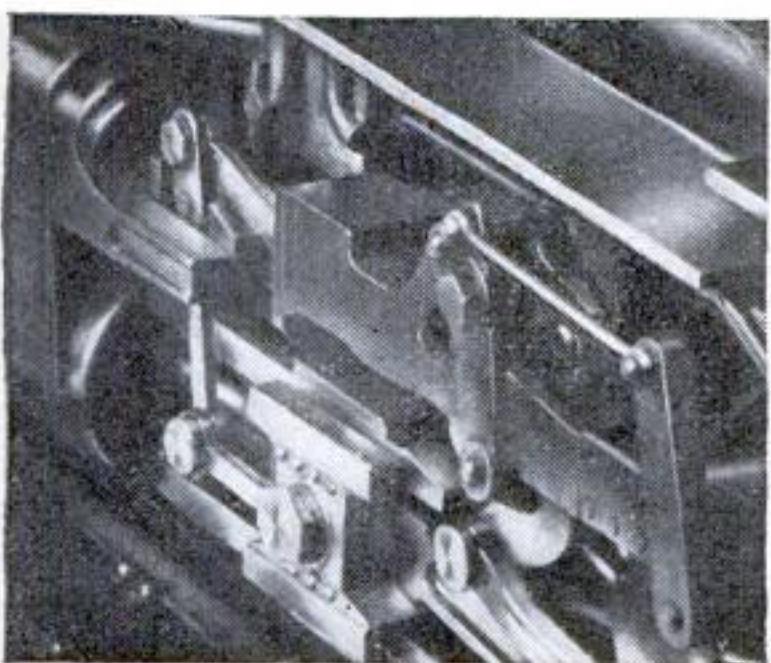
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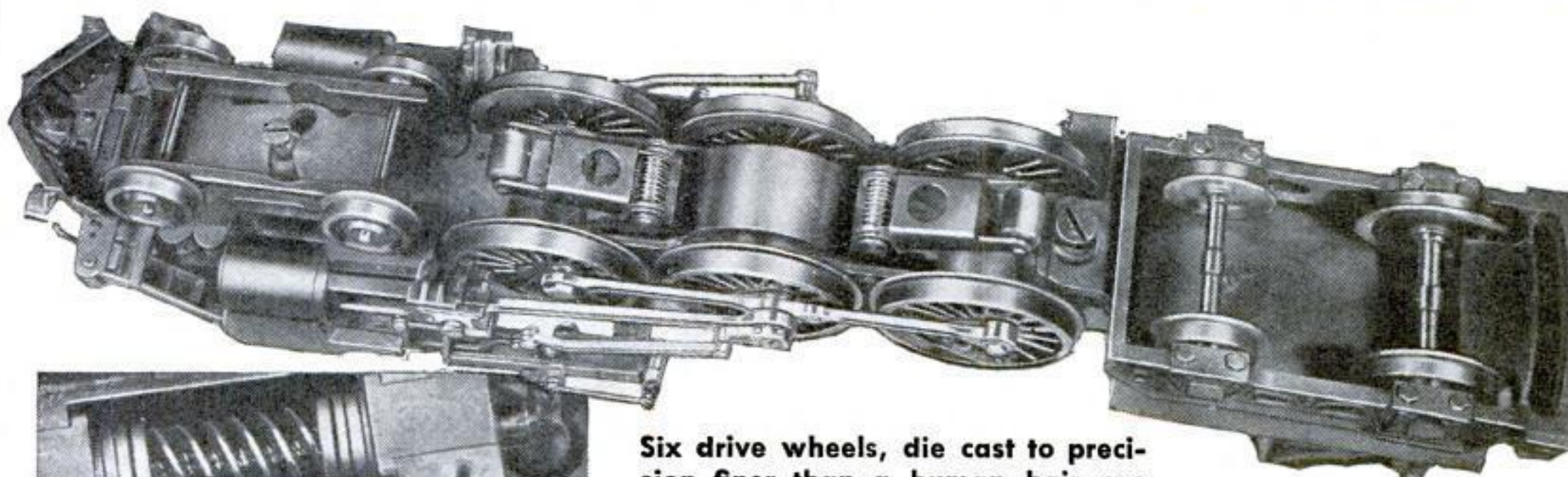
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sources of Lionel have made it possible to produce this model of models at \$75 . . . finished, ready to run and with more exclusive features than any model ever had before: a hinged smoke box cover, complete, actuated Baker valve gear, worm gear precision drive, steel tired wheels, built-in whistle . . . But there's not room here to tell you the whole exciting story so, men, do this: Go to your nearest hardware, electrical or department store and get a copy of the 16-page Lionel scale model booklet, or, better yet, clip out and mail the coupon below.

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Only letters from bonafide home study school students will be considered and these must contain the name of the school and the name of the company, or companies, for whom you have worked since graduation. (Names, however, will be deleted from the letters when published.) We also want to know the kind of course you took and the type of position you have held. Your own identity will be kept anonymous, if desired.

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THE INSPIRING HOME STUDY STORY OF MR. W—— AS TOLD TO H. E. H.

From machinist's helper to President and Chief Engineer of the nationally recognized pump works which bears his name is the record of John A. W——. His success, Mr. W—— states, is due entirely to correspondence school study. He was forced to leave grammar school before the eighth grade in order to help with the family income, but his desire for knowledge was insatiable. When he joined the old L—— & B—— Pump Company as a helper he made up his mind that this was to be his life work. With this ambition he sought out a satisfactory method of increasing his store of technical information. In casting around he happened onto a representative of the —— School and signed up for a course in Mechanical Engineering.



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Secrets of Success

Shortly after this inauspicious beginning he was married and I have often heard him tell of his early struggles with his lessons. It wasn't long until his young bride was making baby clothes of an evening across the kitchen table while he worked away at his lesson assignments. Such a sincere interest in his work was soon recognized and his steady climb to the top began in earnest. At the present time his plant is located at ———, Calif. It is a matter of record that many, if not most, of the notable achievements in the pump field have been made by this master of pump technique. For example, one of his outstanding developments is the deep well turbine pump, to say nothing of the W—— method of "Aqua-analysis." This latter is responsible for saving farmers thousands of dollars in pump equipment. Mr. W—— states positively that home study gave him his chance, and by diligent effort we know how well he has succeeded. He is a member of a nationally recognized engineering association, in spite of the fact that he has no other schooling to his credit from any other school of engineering.

Mr. W—— says, "If a man or woman really has ambition and wants to get ahead, home study will keep him on his toes and ready for promotion."

—J. A. W., Los Angeles, Calif.

HOUSEWIFE SUCCEEDS AS AUTHORESS THROUGH SHORT STORY COURSE

I thought I was going to write the Great American Novel! But Fate—and Margaret Mitchell—decided otherwise. Instead of finishing my university course, in which I was majoring in Short Story Writing, Drama and Journalism, I fell in love, married, moved to a small midwestern city and took care of posterity instead, by producing three sturdy little boys.

However, the old itch to write returned with their departure from babyhood. But the gray matter had slumped; techniques had changed; words didn't leap spontaneously to my mind; my typewriter was on a sit-down strike.

I realized that what I needed was additional training—more mental discipline, if you please, and that I would never get it alone and undirected. I couldn't go away to school again; yet I had to have some mental stimulus to dust away the cobwebs and the accumulation of recipes, feeding formulas and budget plans that cluttered my brain.

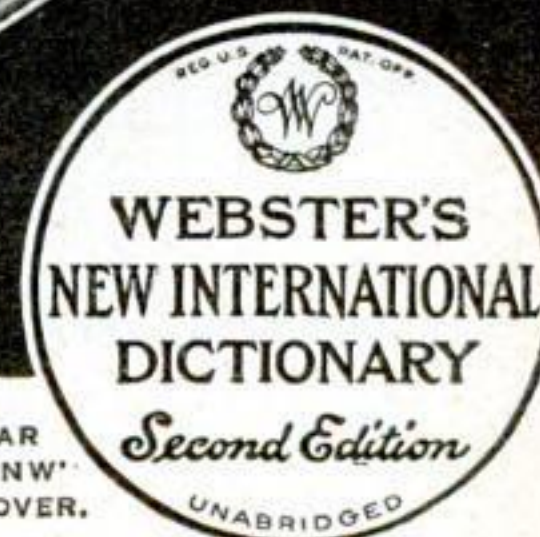
I enrolled in the ——— School, paying for the course out of my house-keeping allowance! At first, it seemed a resumé of what I had studied in school, naturally. But it did more than teach me to write stories. It taught me to concentrate again—to spend thirty or sixty consecutive minutes, or even

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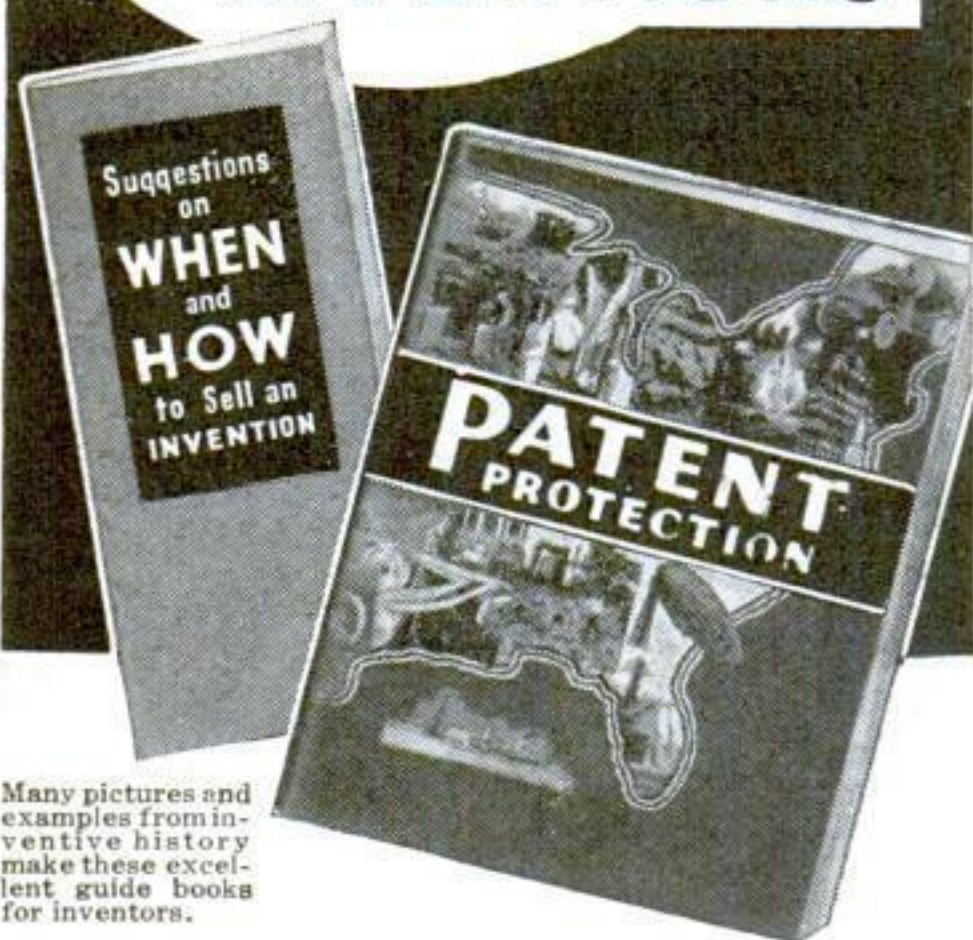
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Secrets of Success

several hours, applying myself to one subject, instead of letting my mind wool-gather, as it had been doing.

I got the "feel" of words again; I spent more and more time on original work, as the assignments became more and more individualized. Then I began writing stories again; in fear and trembling at first—with increasing confidence as I realized that my mind was really mine to command again, that my Short Story Course was really a course in mental rejuvenation!

I know now that I'll never write the afore-mentioned novel. I'm afraid that I won't even write a really great short story. But the stories that I do write usually manage to find a home, even though it may not be in "slick" society, and several articles that I have written for trade journals have had a ready sale.

So I say that it isn't so much *what* course you choose for home study, or in what particular field you choose to advance yourself. The mental training and the open mind; the hours of applied study; the conscious effort to concentrate on your subject, whatever it may be; the getting out of the rut: these constitute the intangible yet one of the greatest benefits derived from any home study course.

—M. E. T., Evansville, Ind.

LEARNS TYPING AT HOME; BETTERS SELF AS TYPEWRITER *SALESMAN

For over five years I plodded along selling typewriters with scant ability to demonstrate them. Having learned the "two finger" method in childhood, it was difficult to learn the touch system, although I twice entered classroom typing schools. In 1932 the Company, with whom I was employed, gave me the name of a firm in my district who were interested in purchasing a number of new machines. It was the best prospect I had had, and I hastened to the offices of the concern with our latest model machine. When I entered, there was a salesman there from a rival concern demonstrating one of their machines.

The buyer watched this demonstration, then asked to hear my story. Mechanically, I knew the machine in and out; could dismantle and reassemble it in a flash but when it came to typing with it, I had to fumble around looking for the letters. It naturally follows that I lost the sale, and—almost lost my job!

I determined to learn how to type, if I had to take a vacation in order to do so. Then it occurred to me to try a correspondence course. Of course, I could have attended night classroom studies, but the hours seriously interfered with my sales work; and, obviously, they could not render a special class for me in the early morning

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Secrets of Success

hours, when I had more time. The correspondence method, however, would afford an opportunity for me to study at any time I desired. I took the course with the ——— School, first explaining to them that I had experienced difficulty in learning the touch system due to early habit of using two fingers. My instructors were exceedingly helpful in teaching me first to forget what I already knew, and begin afresh; then it seemed easy to learn the faster method, and I found time to practice even while demonstrating typewriters.

Not only did the completion of this course prepare me for increased sales, but it has helped me earn extra money in my hobby of writing articles for trade journals. Formerly it was a task to get a manuscript properly typed for submission, and not infrequently did I hire it done by a public stenographer. It is so easy to run off several pages of copy now that it gives me considerably more time to devote to my hobby and to my work as well.

—Z. T., Sandy Hook, Conn.

**Editor's Note: One of the most neatly typed manuscripts we have received in many a day was that of Z. T. whose story is told here.*

Hunt Secret of How Worm Gets a New Head

HOW EARTHWORMS can grow new brains to replace those they have lost through accident is the subject of extensive studies being conducted by Prof. Marcel Avel of the University of Bordeaux, France. If part of the front end of an earthworm is cut off, he reported to the French Academy of Sciences, an entire new head grows on, complete with a brain that controls the worm's organ of taste and its food-grinding apparatus. Strangely enough, the new brain does not seem to be an outgrowth of the spinal cord, but appears to develop independently out of ordinary body tissues. Study of how the earthworm accomplishes this regeneration of nerve and brain cells may lead, it is hoped, to greater success in aiding the repair of damaged human nerve and brain tissues.

Chemical Grows Fruit Without Pollination

GROWTH OF FRUIT in certain plants has been accomplished without the aid of nature's process of pollination, according to a recent report made by Dr. F. E. Gardiner and Dr. P. C. Marth, of the U. S. Department of Agriculture. The formation was obtained in holly and several fruits by spraying the flowers with dilute solutions of a growth-promoting substance. Experiments with certain varieties of edible fruits, such as apples, strawberries, and grapes, were not so successful.



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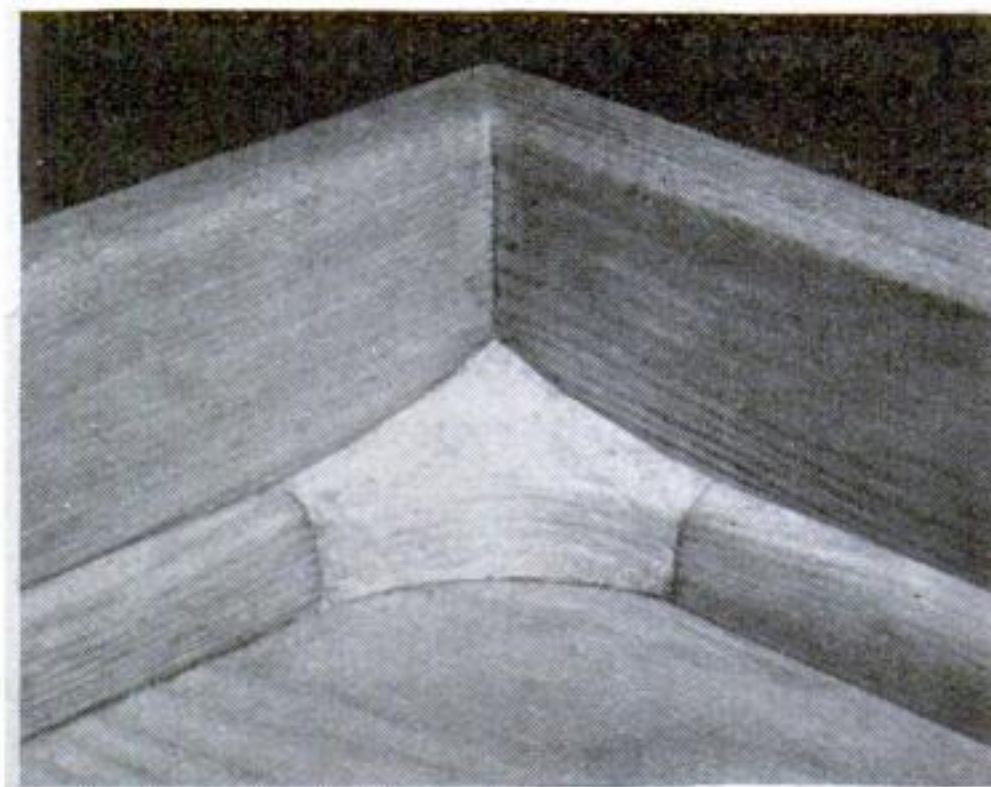
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Name.....

Present Position.....

Address.....



Dusting is made easier by metal plates like this fitted into the corners formed by baseboards

New Ideas for Home Owners

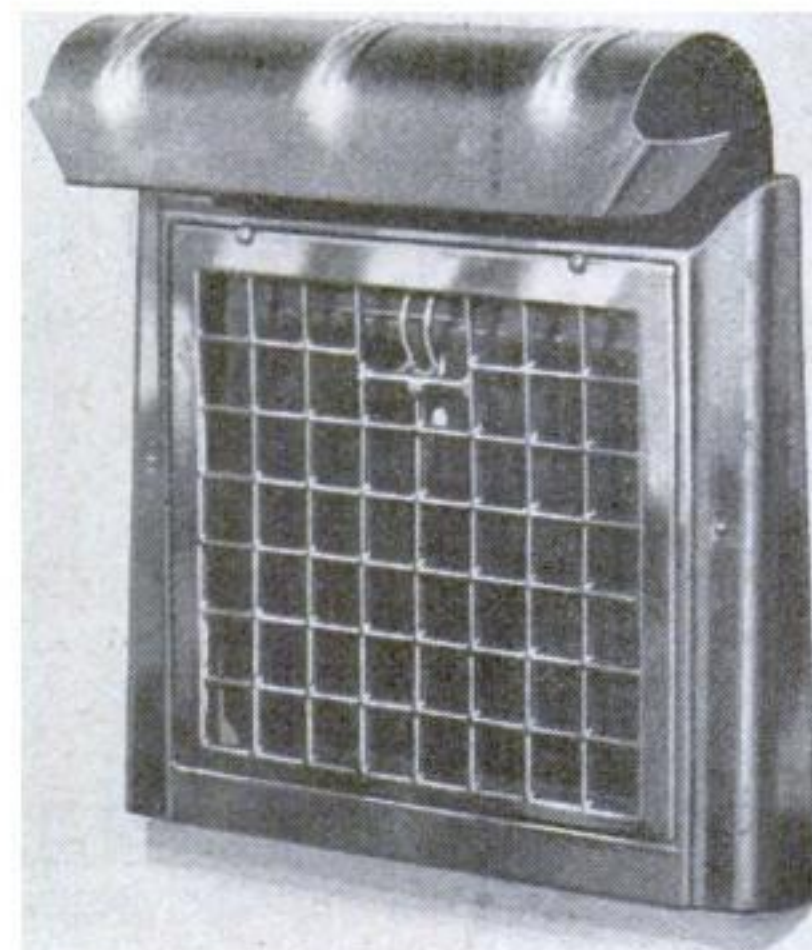
Angle Curve Keeps Dust Out of Corners

DUST and dirt that collect on floors cannot pile up in the corners of a room fitted with a new rounded corner angle for baseboards. Made of metal, the curved unit is nailed to the baseboard so that it is flush with the floor and presents an even, rounded surface.

Thus dust cannot become wedged in the corner beyond the reach of a mop or broom. A close-up of the inexpensive unit is shown in the inset. A feature of the device is its easy installation by the amateur carpenter, it being already shaped to the proper angles.

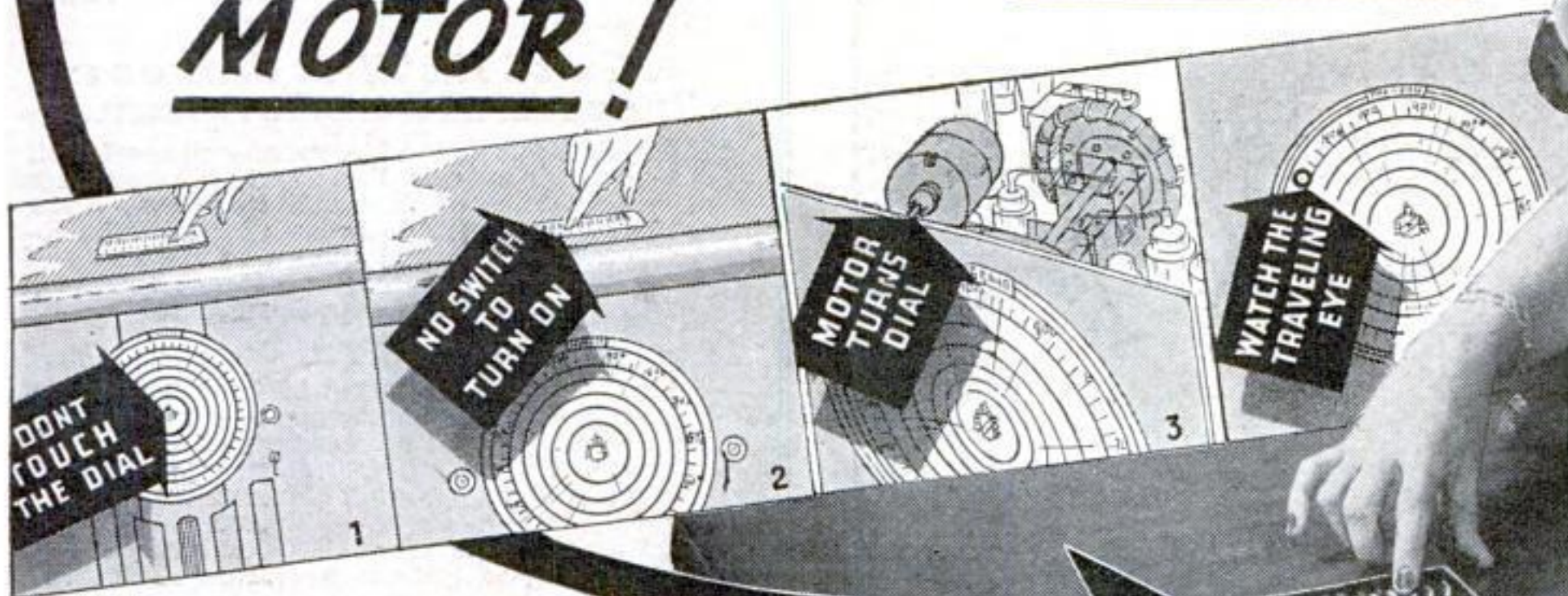
Humidifier Fits Over Hot-Air Register

TO PROVIDE the proper humidity in homes heated by hot air, a new attachment fits over wall or floor registers. Easily attached, the unit has an evaporation pan filled with water and located directly in the flow of warm air. As heat from the furnace increases, evaporation of water vapor also speeds up, thus automatically providing the correct humidity balance. Since less heat is required in homes properly humidified, the device is said to pay for itself in reduced fuel bills. In addition, it prevents woodwork from drying out.



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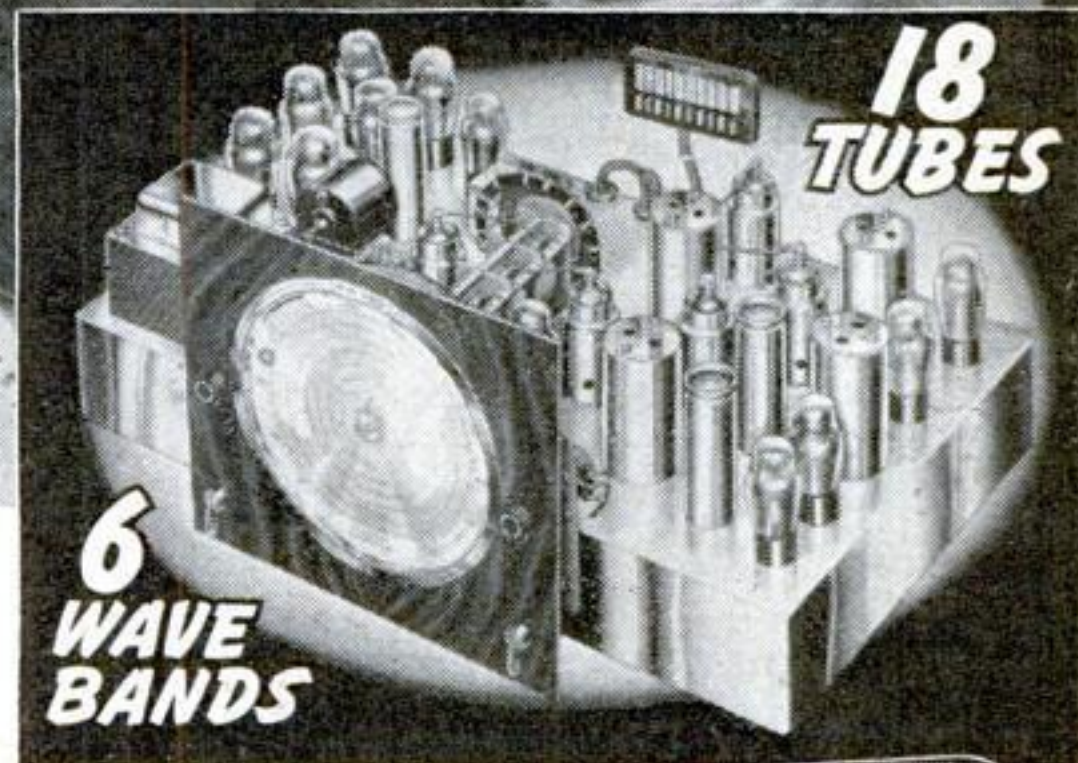


The famous Midwest factory-to-you plan, proven by 18 years of success, is just as exciting. It enables you to buy at wholesale prices—to save up to 50%—to make your radio dollar go twice as far—to enjoy 30 days **FREE** trial in your home.

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Act at once on this unusual factory-to-you offer. We send any Midwest radio you desire to your home. You use it 30 days, and compare it with other radios you have owned or heard. You are triply protected with Foreign Reception Guarantee, One-Year Warranty and Money-Back Guarantee.

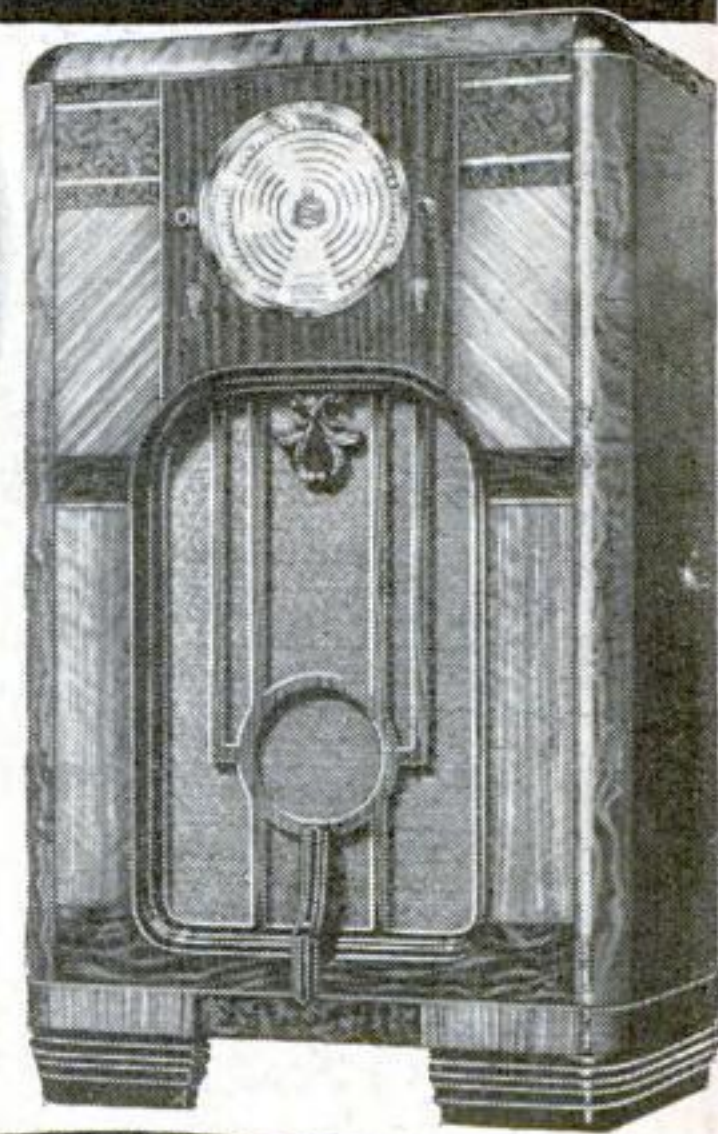
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Foot-Spray Device for Regular Shower Stall

A CONVENIENCE for modern bathrooms is the foot shower shown in the drawing below. Set into the shower wall a short distance from the floor, the unit directs a strong spray of water directly onto the foot. It can be used separately or in combination with the regular shower.



When the treadle is pressed, a spray of water is thrown directly onto the foot

Questions FROM HOME OWNERS

W.M., JACKSON, MISS. Vacuum bottles, picnic jugs, decanters, and other vessels can easily be freed from obnoxious odors that may develop when they have not been used for a considerable period. Procure a small amount of permanganate of potash at a drug store and place a few crystals inside the bottle. Add a few tablespoonfuls of water, shake the contents around thoroughly, and then rinse several times in clean water.

Cleaner For Bronze Fittings

D.W.C., BELLEVILLE, N. J. A saturated solution of common table salt in household vinegar makes an effective and inexpensive cleaning agent for bronze fittings.

Dustproofing Concrete Floor

Q.—HOW can we dustproof the concrete floor of our cellar?—H.J., Springfield, Mo.

A.—FIRST clean the floor thoroughly, removing spots of grease, plaster, and other matter, and then scrub it carefully with clear water. Let it dry for a few days, and then apply a solution made of one part waterglass to four parts of water. This can be wiped on with a mop or broom and should be brushed over the floor surface for sev-

(Continued on page 19)

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Why is it that some men and women whom you have heard speak are able to hold an audience spellbound—are able to play upon the emotions of dozens or thousands of people as easily as the average musician plays upon his musical instrument? Why is it that these people can so commandingly and so gracefully stand before an audience and convince their listeners against their wills—can hold their rapt attention—can bring tears to their eyes—can make them shake the walls of the building with their laughter—with such evident ease?

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Name

Address

Attach letter stating age, occupation, employer's name and address and that of at least one business man as a reference.

Questions from Home Owners

(Continued from page 18)

eral minutes to insure even penetration. At least three applications will be necessary, each one separated by a period of twenty-four hours to allow the solution to harden. Five gallons of the mixture should cover about 1,000 square feet of floor surface with one coat.

Protecting Nails from Rust

N.U., WATERTOWN, N.Y. Nails and tacks kept in damp spots are frequently rendered worthless by rust. However, if they are covered with a solution of one ounce of shellac in a pint of water, scattered freely to remove surplus solution, and then allowed to dry, the adherent shellac coating will protect them from rusting.

Guide for Painting Sashes

Q.—I AM planning to paint the window sashes of my house, but in previous attempts at this job I have always had difficulty in keeping paint from getting on the glass. Is there any way I can prevent this?—E.T.W., Peoria, Ill.

A.—Take a piece of sheet metal—or even stiff cardboard—about five inches square, and hold it alongside the section of sash strip being painted. If the brush happens to run off its course, the paint will hit the sheet metal instead of the glass. The square is moved to follow the work as it proceeds along the window.

Painting Metal Surface

N.N.A., HARRISBURG, PA. Before attempting to paint a metal surface, be sure to clean it well, since the paint will not hold if the metal is even slightly greasy. Washing with benzine will remove any traces of grease.

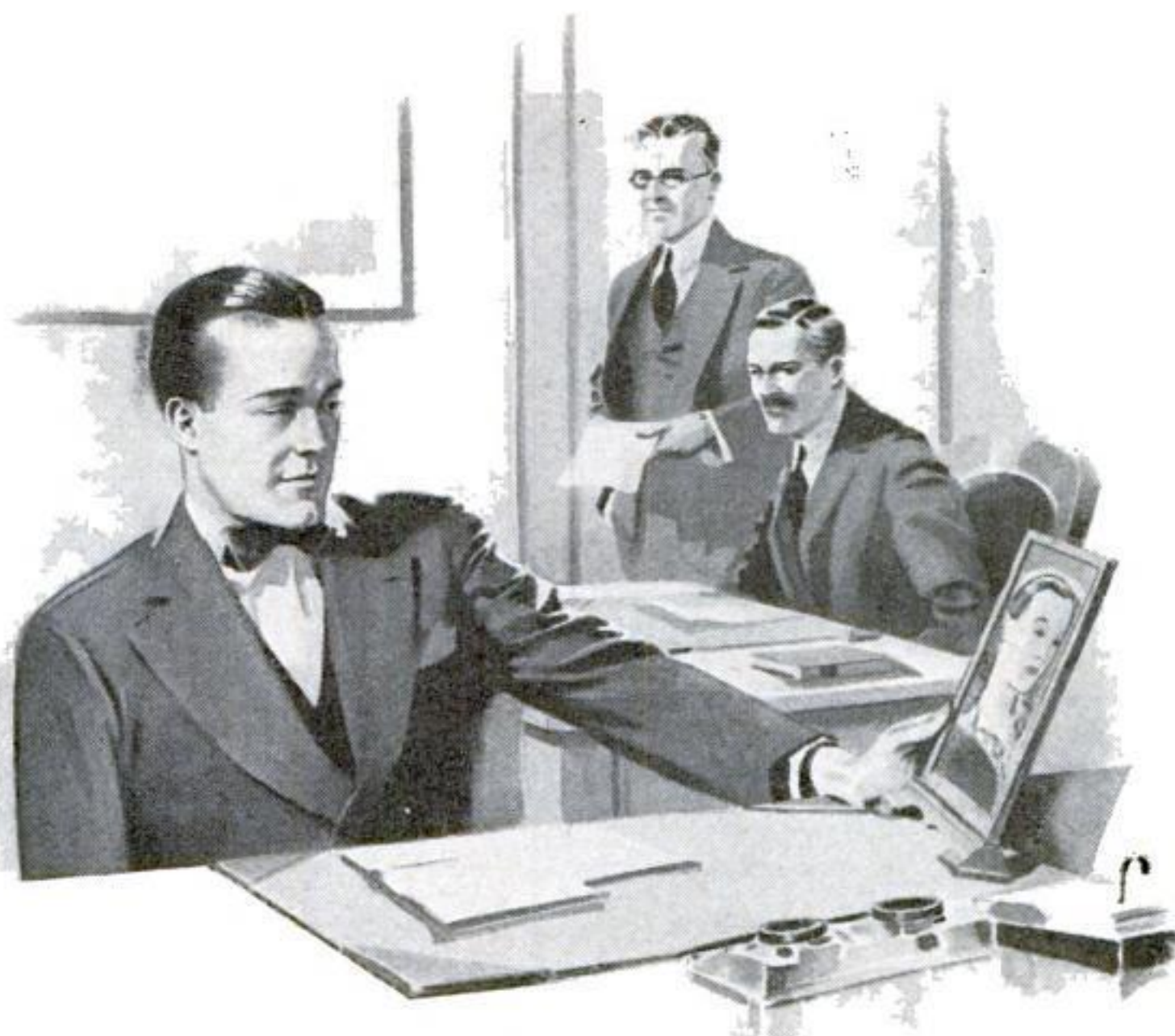
Mending Glassware

Q.—WE HAVE some antique glass that was broken when we moved from one house to another. Is there any possible way to patch it up, or must it be considered a total loss and discarded?—B.R.B., Dayton, Ohio.

A.—CELLULOSE CEMENT is a good adhesive to use for patching glass. If parts of the glass are missing, or shattered into pieces too small to repair, you might try to build up the sections by laminating sheets of transparent cellulose material with a thin coating of the cement. When the proper thickness is reached, shape the material to fit the missing section and cement it in place.

Removing Iodine Stains

P.D.R., TULSA, OKLA. Soak the iodine-stained towels in a strong solution of ordinary photographer's hypo until whitened, and then brush them out in clear, running water.



Isn't she worth fighting for?

SHE BELIEVES in you and depends on you to fight some of her battles for her.

Are you fair to her when you let the days drift by without making a real effort to get ahead? Is it right to ask her to scrimp and save and deny herself when with just a little grit and effort you could provide her with the comforts she would like to have?

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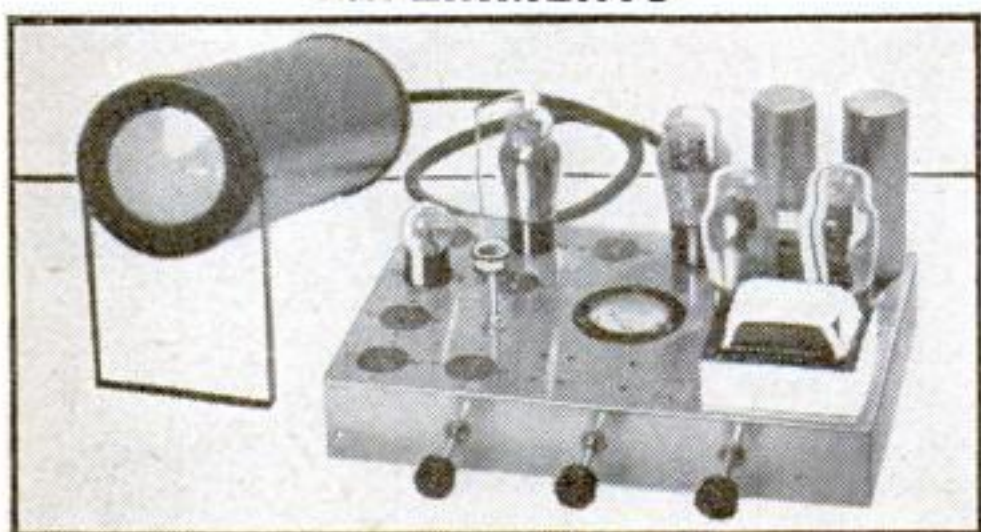
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Trucks House Mobile Television Studio

TELEVISION broadcasts of football games, track meets, prize fights, and other outdoor events may soon be available for home reception as the result of experiments being conducted with portable transmitters recently designed by the National Broadcasting Company, New York City. Two trucks house most of the transmitting paraphernalia, which can be dispatched to scenes of events of interest. O. B. Hanson, NBC chief engineer, points out that the immediate purpose is the training of a group of ten technicians in handling the problems of television broadcasting of events outside the studios.

CONSTRUCTION of the trucks, which are about the size of large busses, was the latest step in eight years of experimental work with television by the company. Apparatus for picture and sound pick-up is installed in one van, and a transmitter, operating on a frequency of 177,000 kilocycles, is mounted in the other. Both picture and sound are relayed by ultra-short wave to the large NBC television transmitter atop the Empire State Building, New York City.

The van carrying the picture and sound equipment utilizes two monitoring kinescope screens, on one of which the engineers watch the scene actually being transmitted, and on the other the scene as picked up by the camera-iconoscope, or scanning eye, preparatory to transmission. Various types of microphones pick up the sound, and a telephone circuit keeps the ten engineers in constant communication with one another. Either of the two portable scanning cameras, mounted on tripods, is focused while the operator looks directly onto the plate of the iconoscope, instead of through a separate set of lenses, as in the case of studio cameras. Five hundred feet of cable connect the pick-up and relaying trucks.

The truck carrying the short-wave transmitter has as its principal apparatus the radio-frequency unit, generating the carrier wave for the picture signals, and modulating apparatus for imposing the picture signals on the carrier. The antenna can be either a single type permanently mounted on the van's roof, or a portable, highly directive antenna raised at the scene being broadcast. An air-cooling system is installed in the transmitter truck, which also utilizes a water-circulating device to maintain the tubes at operating temperature.

TEST programs sent by the field unit are being analyzed through the 100 receivers the company has installed in the homes of trained observers, within a radius of fifty miles of New York City, in connection with studio experiments. The field engineers are experimenting with different types of lenses, filters, and shades, as well as the characteristics of sunlight, effects of reflected light on the image brilliance, and the action of short waves for relaying purposes.



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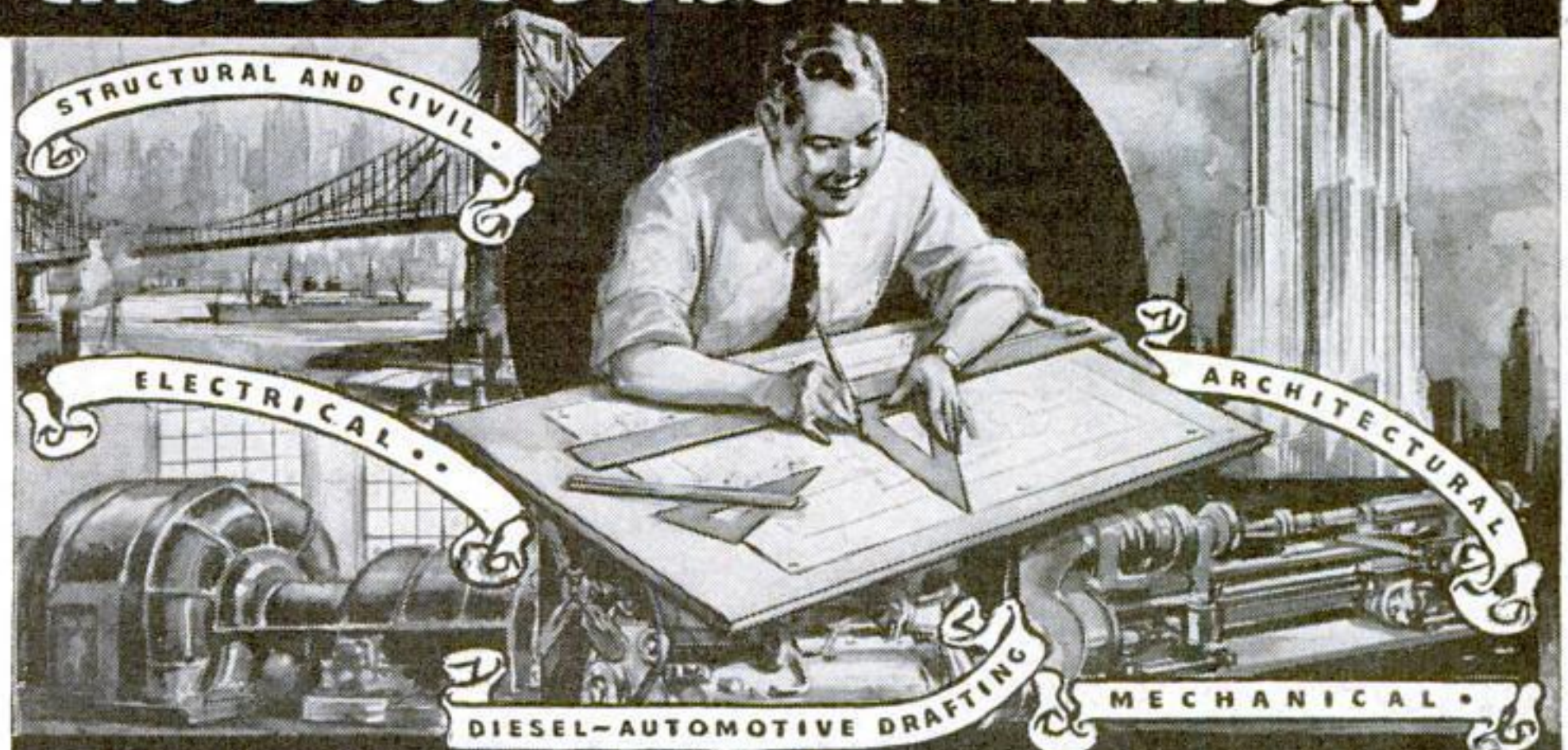
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Model Houses at Fair Will Be Rebuilt Daily

BUILDING houses by day and tearing them down again at night is a novel feature planned for a model village to be exhibited at the coming world's fair in New York City. The village, consisting of what might represent a segment cut out of a town of 3,500 population, will be erected on a ten-acre tract at a cost of \$1,500,000, and will include more than thirty houses, a model nursery school, a community arts center, playground, and stores. Houses will have

from four to ten rooms, and will range in cost of reproduction from \$3,000 to \$15,000. To demonstrate to fair visitors the construction methods used in modern dwellings, several of the buildings will be exhibited at various stages in the process of erection. Work done by carpenters, masons, and plumbers during the day will be ripped out or demolished at night, so that the construction may be repeated again the following day for the benefit of new visitors.

Bunches of Balloons Take Cameramen Up

CLUSTERS of small balloons attached to safety seats are now being used by newspaper photographers to obtain unusual angles in news and other pictures. The balloons, moored to the ground by a rope which is either weighted or held like a kite string in the hands of an assistant, enable the photographer to

snap unusual pictures as he literally hops over the finish line of an automobile race, the scene of a tense golf match, or the field where a track meet is in progress. Bags about four feet in diameter and filled with a light gas provide the lifting power to carry the cameraman to a point of vantage.

Tests Reveal Secret of Insulin Cure

WHAT HAPPENS to the activity of the brain when a patient suffering from schizophrenia, a severe form of insanity, is given an insulin shock, the new treatment for the mental disorder? To find out, medical experts measured the amount of glucose in the blood as it

entered and left the brain, and found that glucose, which is the brain's fuel, is reduced by two thirds during the shock. Since the part of the brain that requires the most fuel also controls consciousness, cutting off the fuel supply also interrupts consciousness.

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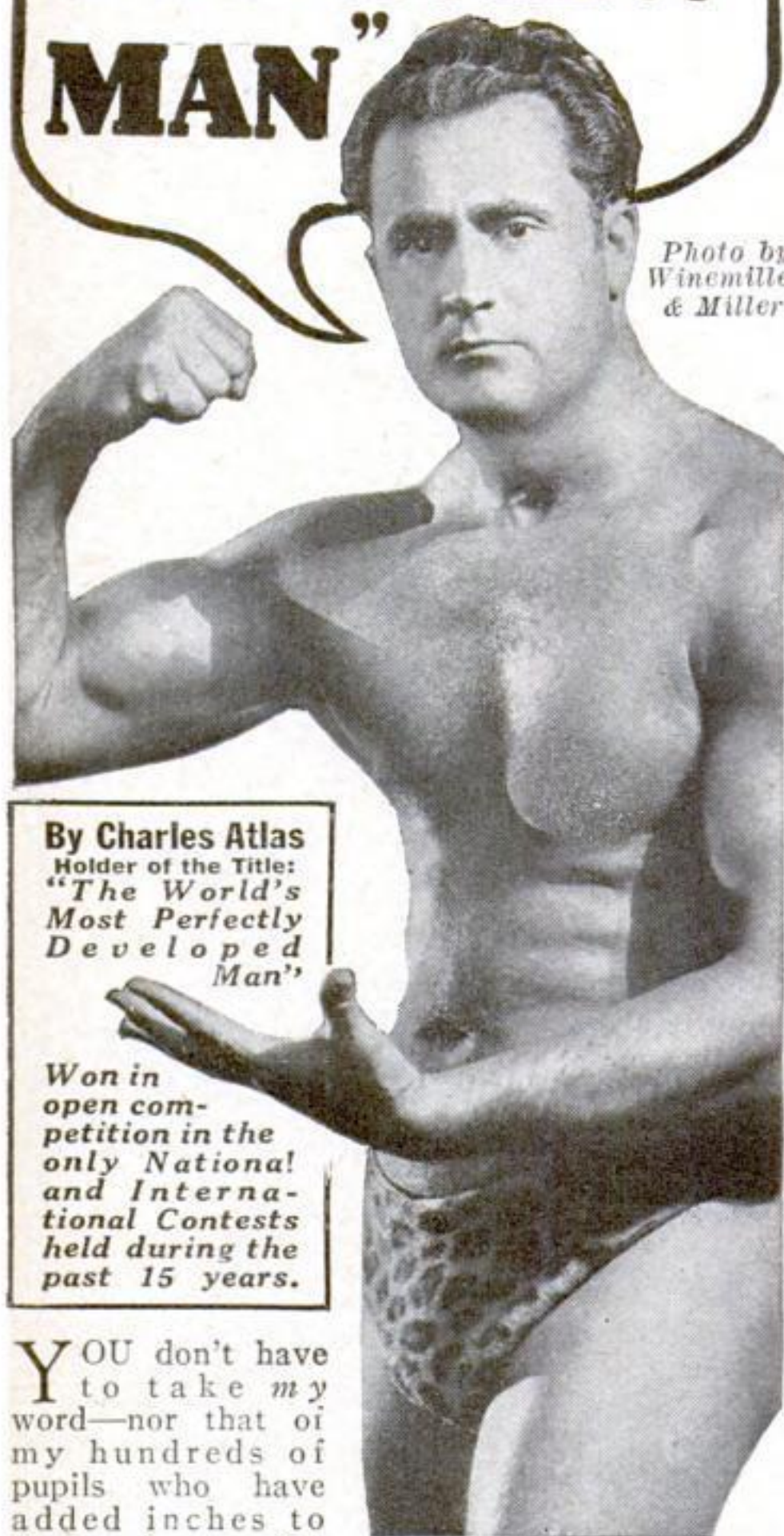


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Snails Hitch Rides in Hurricanes

RARE land snails, native to the island of Cuba and now found in Florida, are carried across the intervening expanse of ocean by violent hurricanes that sweep out of the Caribbean Sea, according to recent studies made by Dr. Carlos de la Torre, noted Cuban naturalist. The gastropods attach themselves to tree leaves by means of a sticky secretion. During violent storms, the leaves are ripped from the trees by winds of gale force and borne across the water with their snail stowaways. As one proof of this contention, Dr. de la Torre laid out a map of the Cuba-Florida region, spotting the localities where snails of the same species have been found. On the same map he traced the paths of major hurricanes and found that these locations were nearly always on one or another of the hurricane highways.

Old Oil Wells Revived

ABANDONED oil wells in Soviet Russia are being reclaimed successfully by forcing compressed air, heated to 600 degrees centigrade, into the ground. One well, abandoned as unproductive in 1930, now yields 550 tons of oil a month by the process which forces oil from the underlying porous sands.

Grenade Is a Repeater

A new hand grenade devised by a Pittsburgh, Pa., inventor for war-time use contains three separate charges of poison gas that are released at consecutive intervals. The war implement has three distinct gas compartments, which break off from the main unit and release their vapor one after the other, in response to the detonating action of built-in explosives. Thus one of the new gas grenades can be made to cover three times the area of conventional types. The device is thrown by hand, and after the first explosion it automatically propels the remaining sections on to a point more distant from the thrower, where another gas section explodes and breaks off from the grenade.



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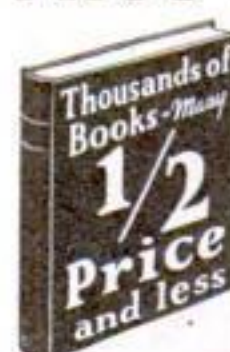


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X-Ray Device Takes Snapshots of Heart

CONTROLLED by the heart action itself, a new exposure device for use with X-ray cameras, makes it possible to take snapshots of the human heart. Ordinary X-ray machines are not fast enough to catch a clear picture of a single phase of the heart's action for use in the diagnosis of certain heart ailments. In the new apparatus, a cuff fastened around a patient's wrist picks up the pulse beat, which is then amplified and used to control the exposure of the X-ray camera. In this way, it is said, four or five partial exposures can be taken in rapid succession. On the developed film, the partial exposures overlap to produce one complete exposure, showing the heart in a single phase of contraction or dilation.

Night Blindness Laid to Lack of Vitamin A

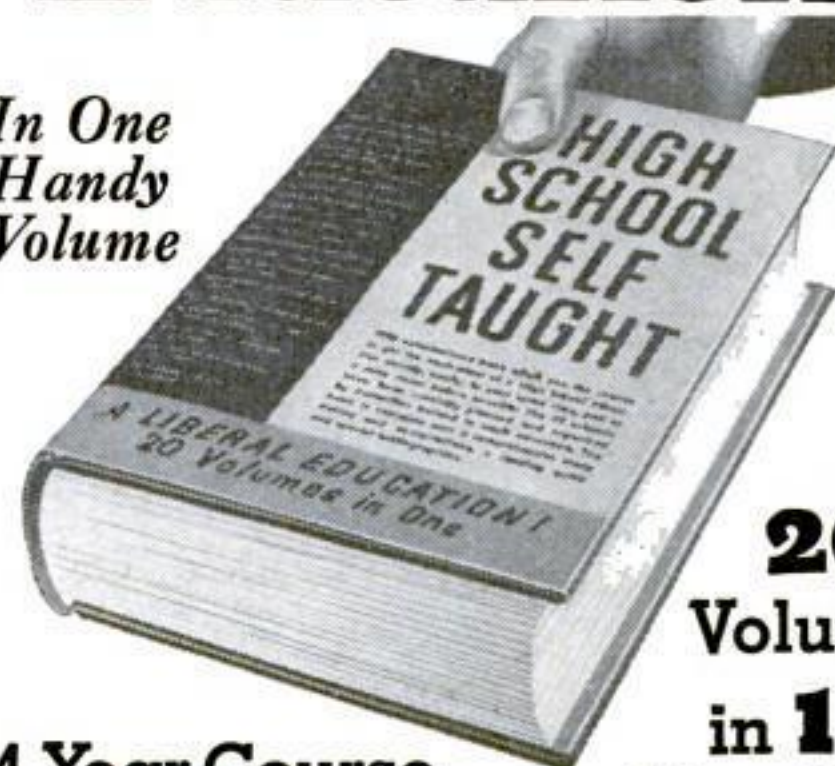
LACK OF ADEQUATE vitamin A in the human body is one of the causes of night blindness, according to results obtained by an eye-testing machine devised by Dr. William J. Ezickson and Dr. Jacob Feldman, and displayed recently at Philadelphia, Pa. The doctors pointed out that night blindness is the inability of the eye retina to adjust itself quickly to changes in the intensity of light. They also cited lack of vitamin A as one of the factors making persons more readily susceptible to common colds, and added that persons suffering from colds are frequently afflicted with night blindness. In studying accident cases among truck drivers and others who drive much at night, Dr. Ezickson said, he found accidents occur very often immediately after a driver has been off duty because of a severe cold.

Mechanical Noses Sniff Tunnel Gas

DETECTORS that automatically turn on ventilating fans when carbon monoxide gas is present in a given quantity, recently were built into a vehicular tunnel that restored to use an abandoned trolley-car tunnel in New York City. The fifty-year-old tunnel was first used for horse cars. Later it was used by cable cars and electric cars, but with abandonment of the latter in favor of motor busses, it became disused. In the restored tunnel, huge fans start revolving when the carbon monoxide fumes released by automobile exhausts reach a volume of two parts in 10,000 of air. The harmful gases are carried by ducts to the street level long before they are present in sufficient quantity to cause injury to humans. When the giant blowers have cleared the tunnel of noxious fumes, they automatically shut off until needed again. No harmful results, therefore, can occur if a traffic jam blocks a number of cars in the underground passage.

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Germes Put in Stone To Find Their Life Span

HOW LONG can disease germs live? To solve this problem, bacteriologists at Notre Dame University, South Bend, Ind., recently prepared six cultures of bacteria, sealed them in glass tubes, and deposited them in the cornerstone of a biology laboratory just erected on the campus. The specimens will remain there until the building is demolished some 150 to 200 years from now, according to Dr. James A. Reyniers, head of the bacteriology department of the university. A typed list of instructions concerning the handling of the sealed bacteria, and addressed to whatever person opens them, was placed with the tubes in the cornerstone.

Powerful Magnets Give New Low Temperatures

POWERFUL ELECTROMAGNETS will be used to obtain temperatures close to absolute zero, a point 459 degrees below zero Fahrenheit, and the theoretical low limit of cold, according to a recent announcement by Westinghouse Electric Company research engineers. Because heat is nothing more than molecular motion, the powerful unit will be used to produce frigid temperatures by restraining the motion of atoms magnetically, it is explained. The magnetic process is said to be more efficient and to occasion less trouble than producing extremely low temperatures by such present methods as the liquefaction of helium gas.

Lollipops Prescribed If Child Has a Cold

FEED CHILDREN LOLLIPOPS as a treatment for common colds. This is the unusual advice given by Dr. H. Harris Perlman to other doctors attending a recent medical convention held in Philadelphia, Pa. The candy sticks, it is explained, are not only high in caloric content, and therefore useful as a nourishing food, but they also serve to make the children thirsty, and lead them to drink large quantities of water. Physicians warn parents, however, not to tell their children the reason for the lollipop treatment, or the youngsters will have "colds" all the time.

People Can't Recognize Their Own Voices

MOST PEOPLE CANNOT recognize the sound of their own voices. This is the unusual statement made recently by Dr. W. Wolff, of the Psychological Institute of the University of Berlin, Germany. Dr. Wolff made faithful recordings of the voices of a number of speakers, and then played them back. Voices were usually recognized by friends and acquaintances of the speaker, but most owners themselves were unable to identify their own voices.

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Tiny Tropical Island Is "Monkey Paradise"

SANTIAGO, a tiny island two miles off the port of San Juan, Puerto Rico, serves as a "monkey paradise" for a dozen simians that recently were shipped from New York under the care of Felix Lamela, of the Columbia University School for Tropical Medicine. Valued at approximately \$10,000, the group included eight gibbons, two nocturnal lorises, and two Capuchin monkeys, who will live on the uninhabited island and breed a pure strain of descendants for scientific experiments and medical research. Scientists will visit the island once a week to check on the monkeys' behavior and test their reactions to pneumonia and other disease germs. A number of years ago, 1,500 fruit trees were planted on Santiago to provide a source of food for the monkeys.

Explorers Broadcast Experiences by Radio

FROM WILD, unexplored territory deep in the interior of British Guiana, South America, members of an expedition sponsored by the American Museum of Natural History will report their progress by means of special radio programs that will be relayed by short wave to New York City, and rebroadcast over a nationwide hook-up. Led by Dr. William Hall Holden, staff surgeon of the museum, the expedition expects to penetrate into jungles hundreds of miles from their seacoast base at Georgetown, to study rare diseases and drugs of remote Indian tribes, and to make scientific collections of little-known reptiles, amphibians, small insects and mammals, and various types of botanical specimens. Radio equipment designed especially for the expedition will be used, not only to report their discoveries and progress to the outside world, but also to enable the party to take bearings on South American radio stations, and chart their course through jungle territory that has never before been entered by white men.

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2. Use only pencil or pen.
3. We return no drawings.
4. Print your name, address, age, occupation on back of drawing.
5. All drawings must be received by November 26th, 1937. Prizes will be awarded for drawings best in proportion and neatness by Federal Schools Faculty.

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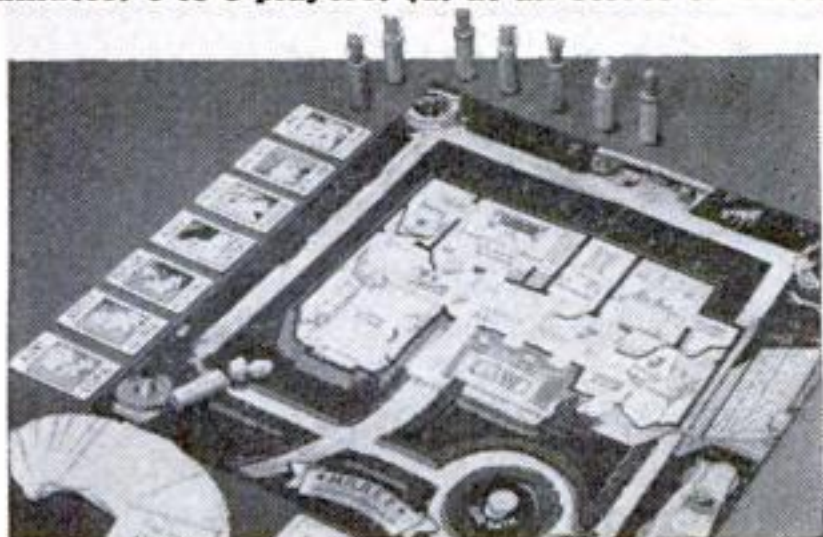
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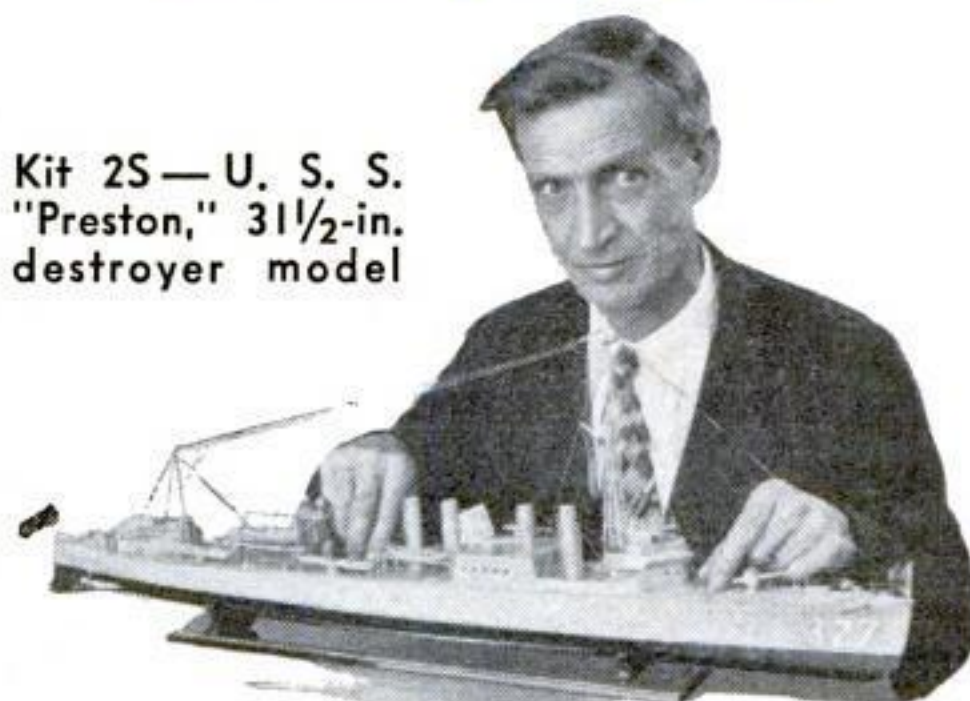
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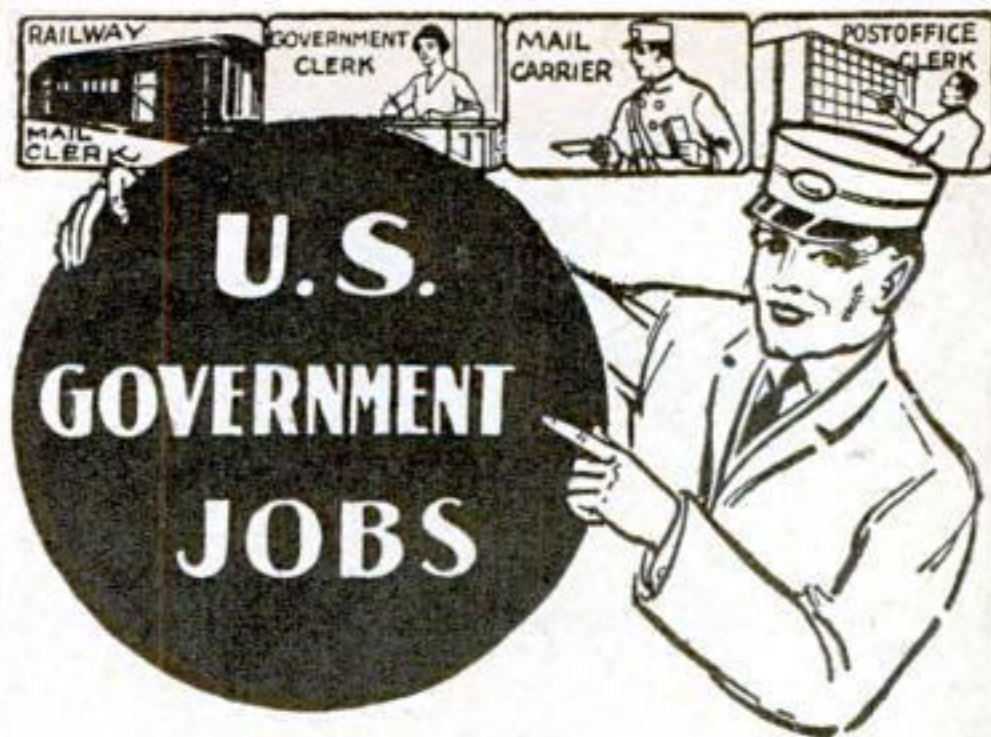
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(Continued on page 28)



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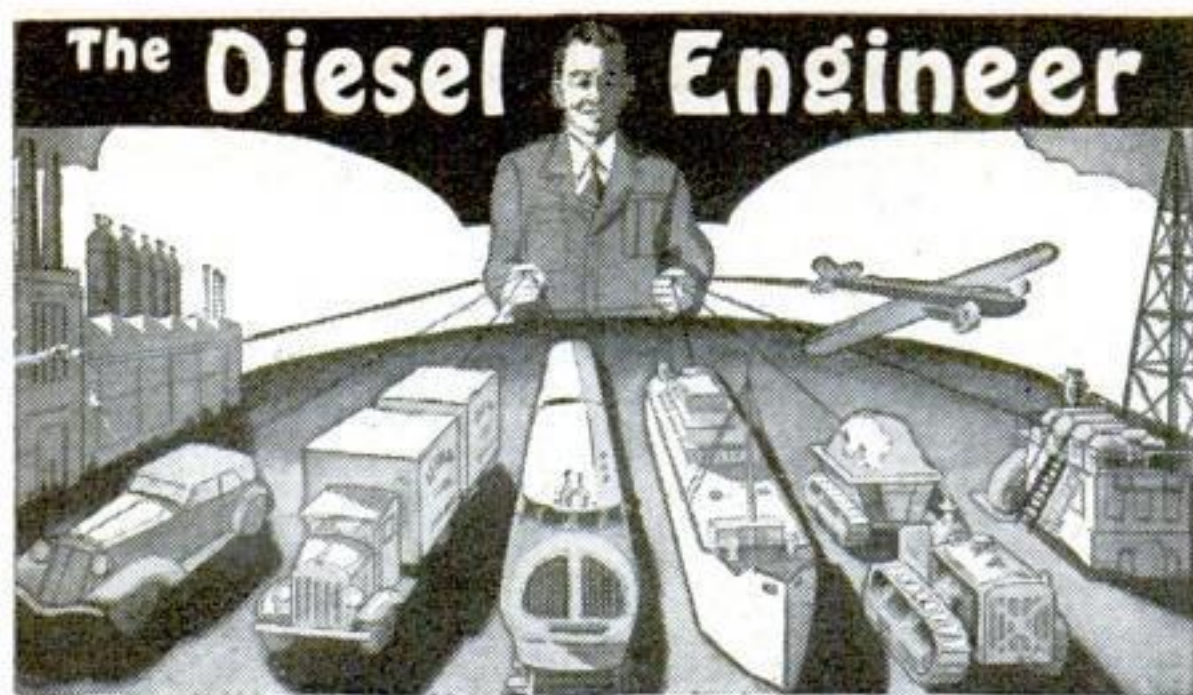
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Craftwork Kits for Gifts

(Continued from page 27)



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Peroxide May Replace Yeast To Raise Cake

BAKED GOODS raised with hydrogen peroxide instead of yeast or baking powder may be a new contribution of chemistry to the baking industry. Hydrogen peroxide, once widely used as an antiseptic solution, is added in small amounts to the water or milk with which dough is prepared, causing it to rise in the same manner as yeast or baking powder. Better employed as a leavening agent for cakes and biscuits than for bread, the peroxide has the advantage of leaving no residue.

Energy of Weak Magnet Balances Tiny Scale

WEIGHING QUANTITIES as small as one fifteen-millionth of an ounce, a tiny scale designed for use in microchemical work, is so small that a weak magnet is used as a counterbalance instead of the conventional set of weights. Despite its diminutive size, the balance is sufficiently stable so that it is not disturbed by the ordinary vibrations that have affected previous microbalances. With the new scientific tool, experts predict, chemists will be able to analyze a great number of complicated organic compounds.

Scientists Study Ills Caused by Altitudes

STRANGE BODILY CHANGES experienced at high altitudes are being studied by Russian scientists using Mount Elbrus, a high peak in the Caucasus range, as their mountain laboratory. "Mountain sickness," unreal visions, and other hallucinations have been noted in previous high-altitude research, and have been blamed either on thin air and consequent shortness of breath, or on extreme exertion under these adverse conditions. New observations by the Soviet experimenters indicate that certain colors seem to become more vivid at high altitudes, and other colors less so, a fact that may explain some instances of airplane pilots crashing into peaks or mountainsides that appeared to be nothing but fog or clouds. The sense of taste is also affected by height, it is reported, since most climbers acquire a sudden and unexplainable dislike for meat at high altitudes.

Poor Paper and Ink May Erase History

THAT A "LOST CENTURY" may be in the making is the belief of Dr. Frank L. McVey, president of the University of Kentucky. Because so much of the paper and ink in current use is of inferior grade, the educator believes, the time may come when historians, attempting to trace the events of the present era, will discover that written records of it have passed out of existence by deterioration.

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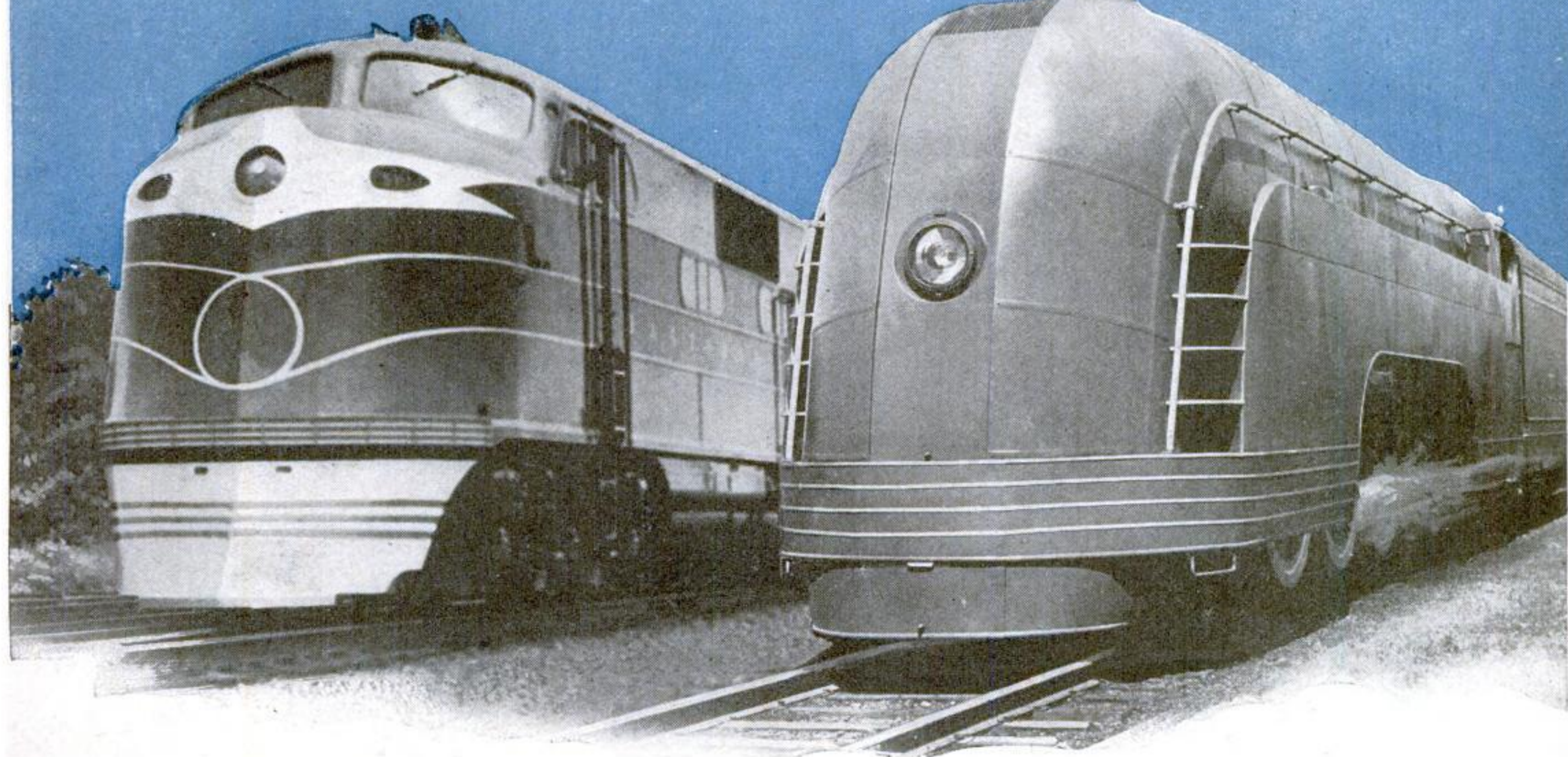
POPULAR SCIENCE

Monthly

RAYMOND J. BROWN

Editor

Steam Still Rules the Rails



SHAPED like a giant projectile and packing the punch of 5,000 horsepower beneath its streamline shell, a steam locomotive under construction for the Baltimore and Ohio Railroad will whisk a train of fourteen standard Pullman cars over the rails at speeds up to 100 miles an hour. Sheer power alone would make it outstanding among the world's passenger engines. Yet even that claim to distinction is eclipsed in interest by machinery more suggestive of an automobile than of a locomotive.

There will be no chuff-chuffing as the monster picks up speed from a standing start. Passengers in the cars behind will

By
ALDEN P. ARMAGNAC

miss the familiar jerking as a heavy train pulls out of a station. Instead, there will be the same smooth get-away that a motorist experiences when he steps on the gas. And the reason is much the same.

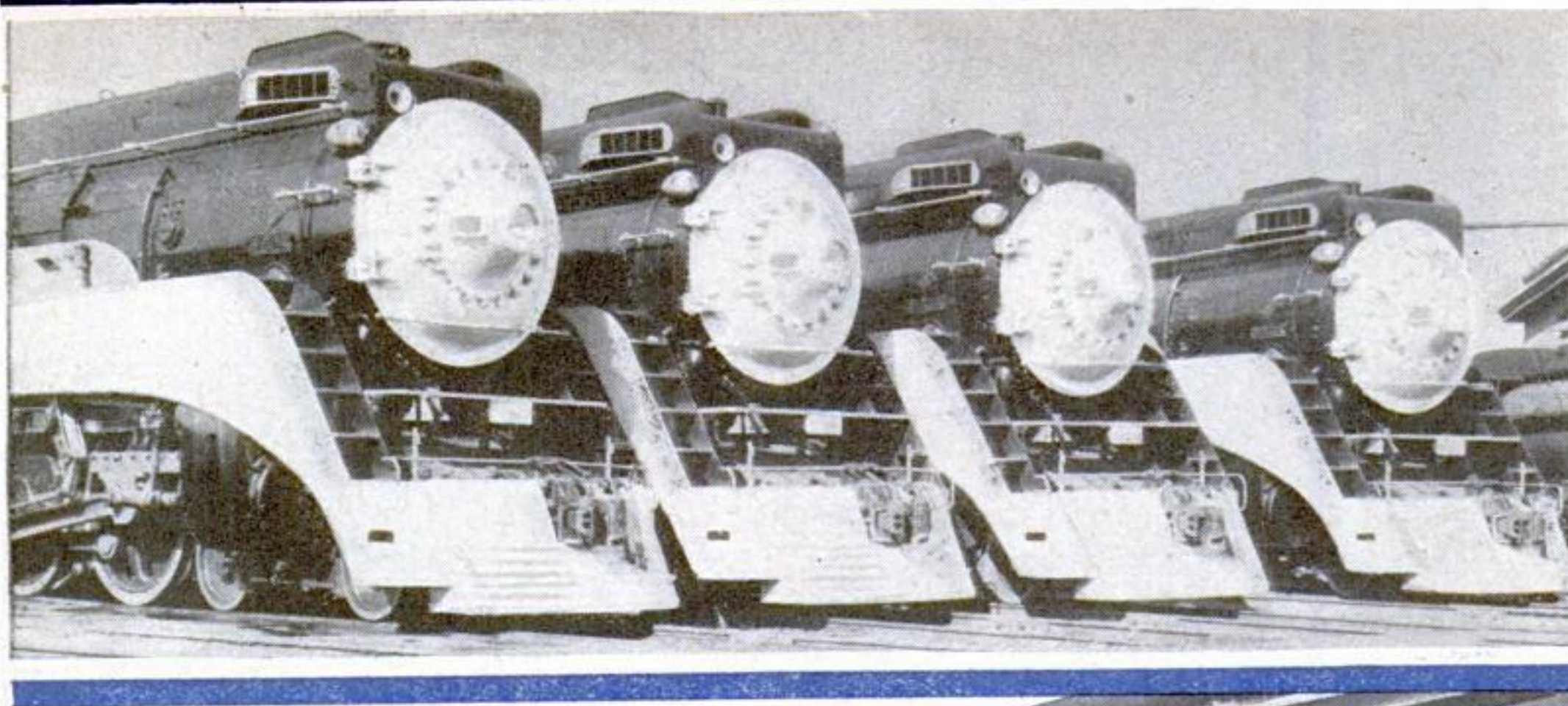
Each pair of driving wheels on the new speedster will be powered by a separate four-cylinder engine resembling a V-type automobile motor. Instead of the single pair of cylinders and heavy connecting rods used on the conventional locomotive, four independent steam mo-

tors operating through oil-bathed gears will drive the giant's eight traction wheels. The result will be a virtually unbroken stream of power, like that of a modern automobile of many cylinders.

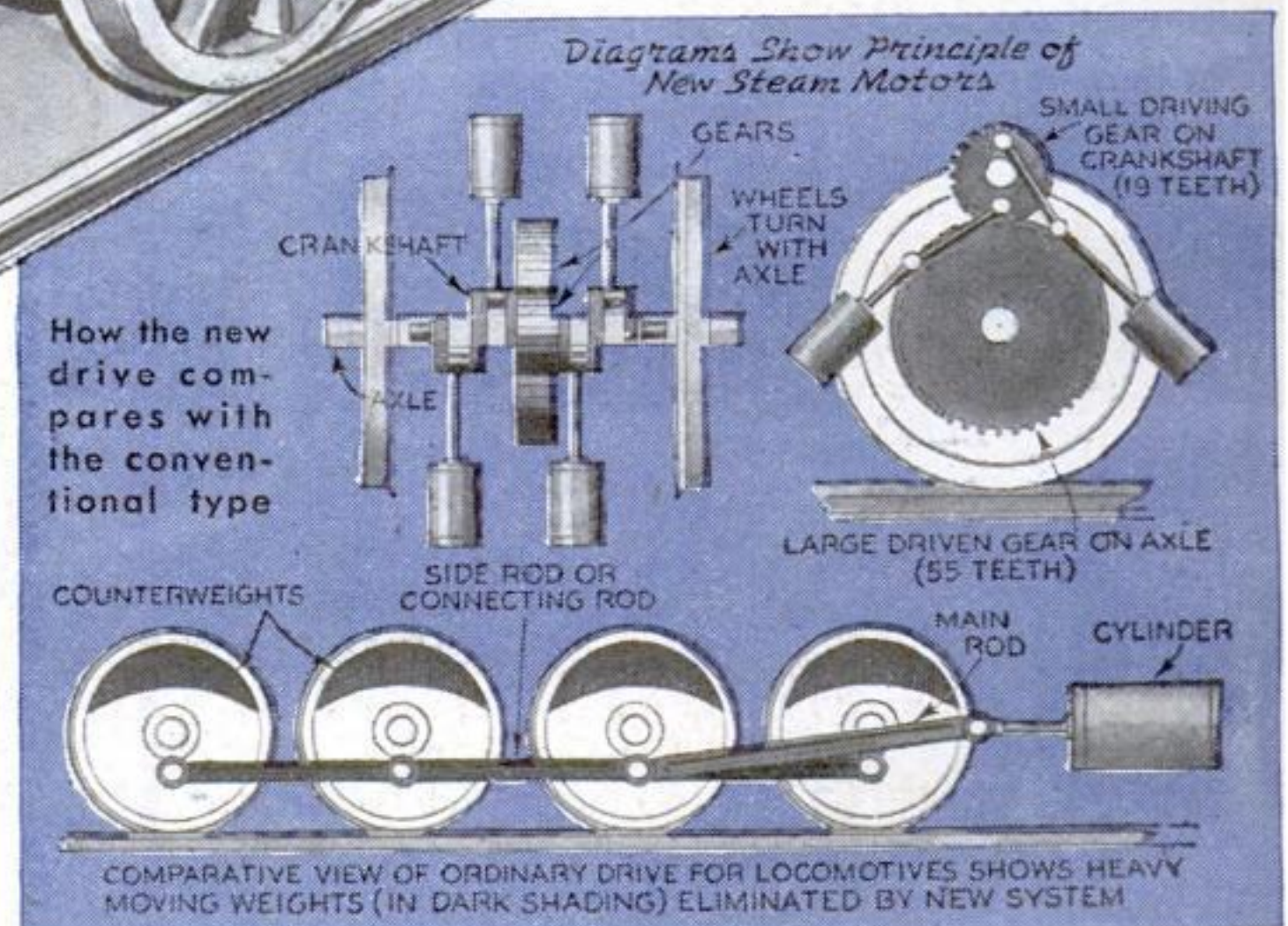
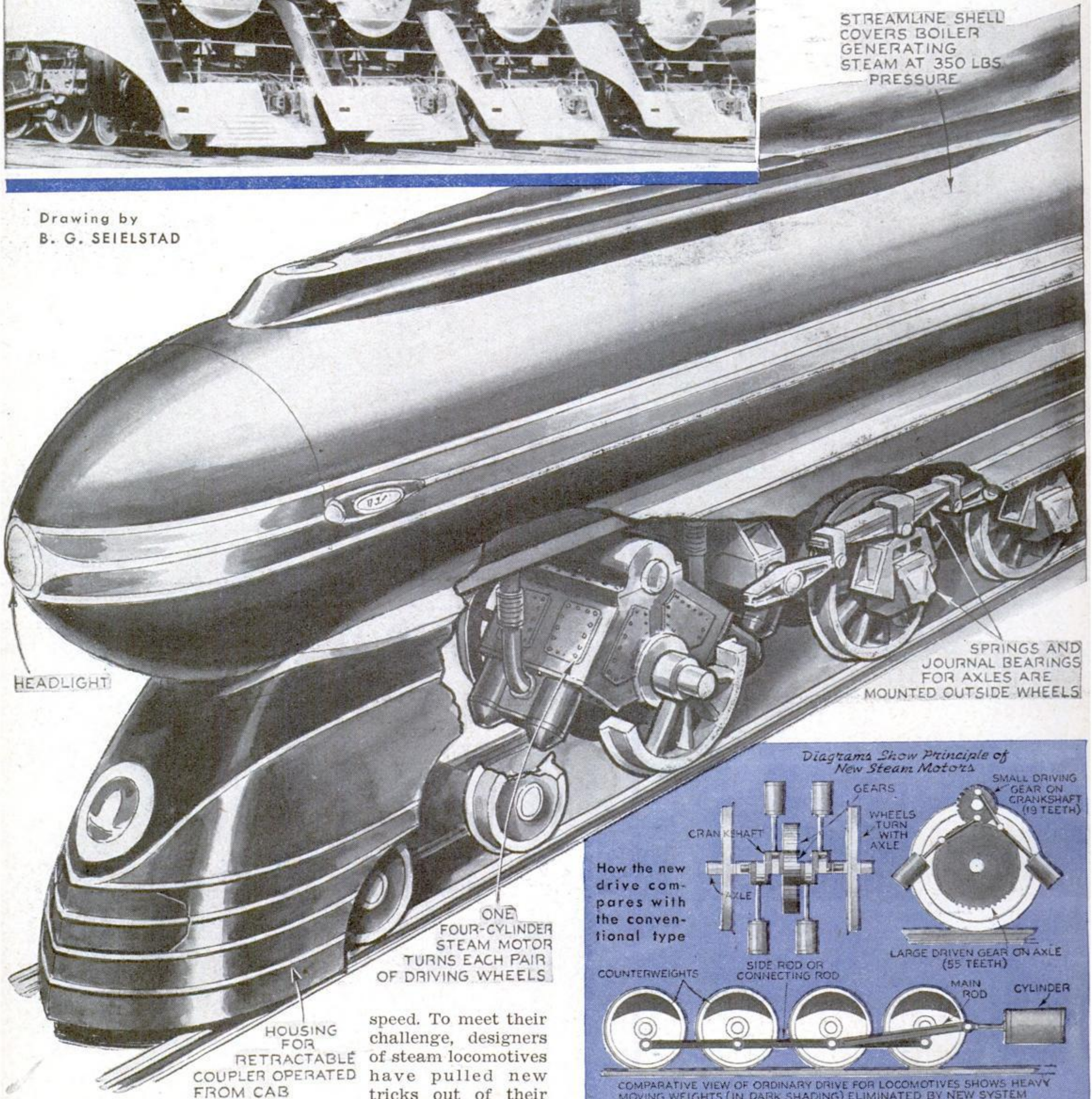
Not only for its quick get-away, however, does the B. & O.'s new 5,000-horsepower streamliner commend itself to railway men. By eliminating the massive pistons and connecting rods, it also does away with the heavy counterbalancing weights on the rims of the wheels, required to equalize the thrust of the driving rods and the weight of the heavy crank pins. Gone with them is the punishment all these moving weights inflict on the track, even when they are care-

AMAZING NEW LOCOMOTIVES MEET THE CHALLENGE OF THE DIESELS

Four of the brilliantly colored monsters that haul the Southern Pacific's dawn-to-dusk flyers between Los Angeles and San Francisco, Calif. With a rating of 4,500 horsepower, they are among the world's strongest locomotives



Drawing by
B. G. SEIELSTAD



fully balanced. In extreme cases, when locomotives have been sent out without proper counterbalancing, the rails have later been found to be bent downward as much as a quarter of an inch every fifteen feet or more, where the heavy sides of the driving wheels had struck.

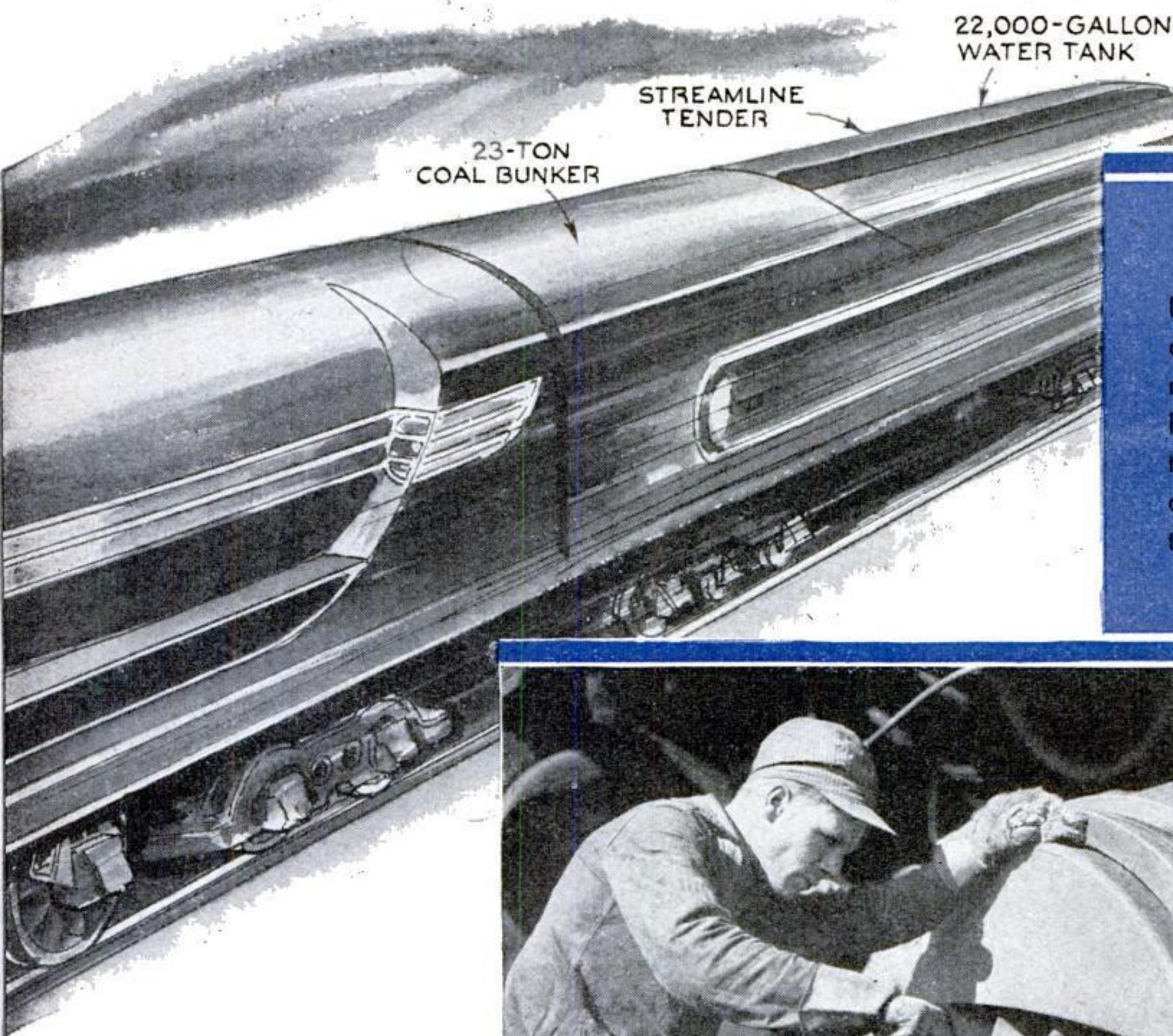
Here is one railroad's answer to the sleek, smooth-starting Diesel-powered streamliners that have captured popular fancy with their colorful modernistic design and their runs of unprecedented

speed. To meet their challenge, designers of steam locomotives have pulled new tricks out of their bag—and produced some of the most powerful, fastest, and queerest-looking locomotives ever seen on rails.

Discarding their somber black dress of a few years ago, steam locomotives have blossomed out into rainbow tints, like the crimson, black, and orange monsters that haul the Southern Pacific's dawn-to-dusk flyers between Los Angeles and San Francisco. When the New York Central's gray-and-silver *Mercury* roars through the night, floodlights outline its whirling seventy-nine-inch driv-

ers and give it the appearance of a meteor on rails. Smokestacks have disappeared from the steam-powered locomotive, and fins like airplane wings divert the smoke from the engineer's field of view.

Virtually unchanged during the lives of generations of railroaders, the steam locomotive is being reborn today in a myriad of new forms. First of its kind ever built, the B. & O.'s recently completed *George H. Emerson* has cylinders



MODERNIZING THE IRON HORSE

Driven by four four-cylinder engines, one for each pair of drive wheels, this new monster of the rails develops 5,000 horsepower and can pull a train of fourteen standard Pullman cars at 100 miles an hour. Its vibrationless power is like that of a many-cylindered automobile



Counterbalancing weights like this, required on drive wheels of ordinary locomotives, are eliminated in the new engine

both at front and rear, each set turning four of the eight drivers that propel the engine at ninety miles an hour. While the scheme does not eliminate the driving rods joining pistons and wheels, it does materially lighten them, since each set bears only half of the usual strain.

Locomotives with sixteen cylinders, locomotives with four cylinders—and now American designers propose steam locomotives with no cylinders at all! Before long the Association of American

Railroads is expected to begin construction of a 120-mile-an-hour steam-turbine locomotive. According to L. P. Michael, chief engineer of the Chicago and

Northwestern Railway, turbine locomotives will prove more economical to build and maintain than cylinder-and-piston types. The whirling rotary blades of the 4,000-horsepower turbine will be geared directly to the wheels instead of to connecting rods, as in experimental European types, and will operate on less than nine pounds of steam an hour for each horsepower.

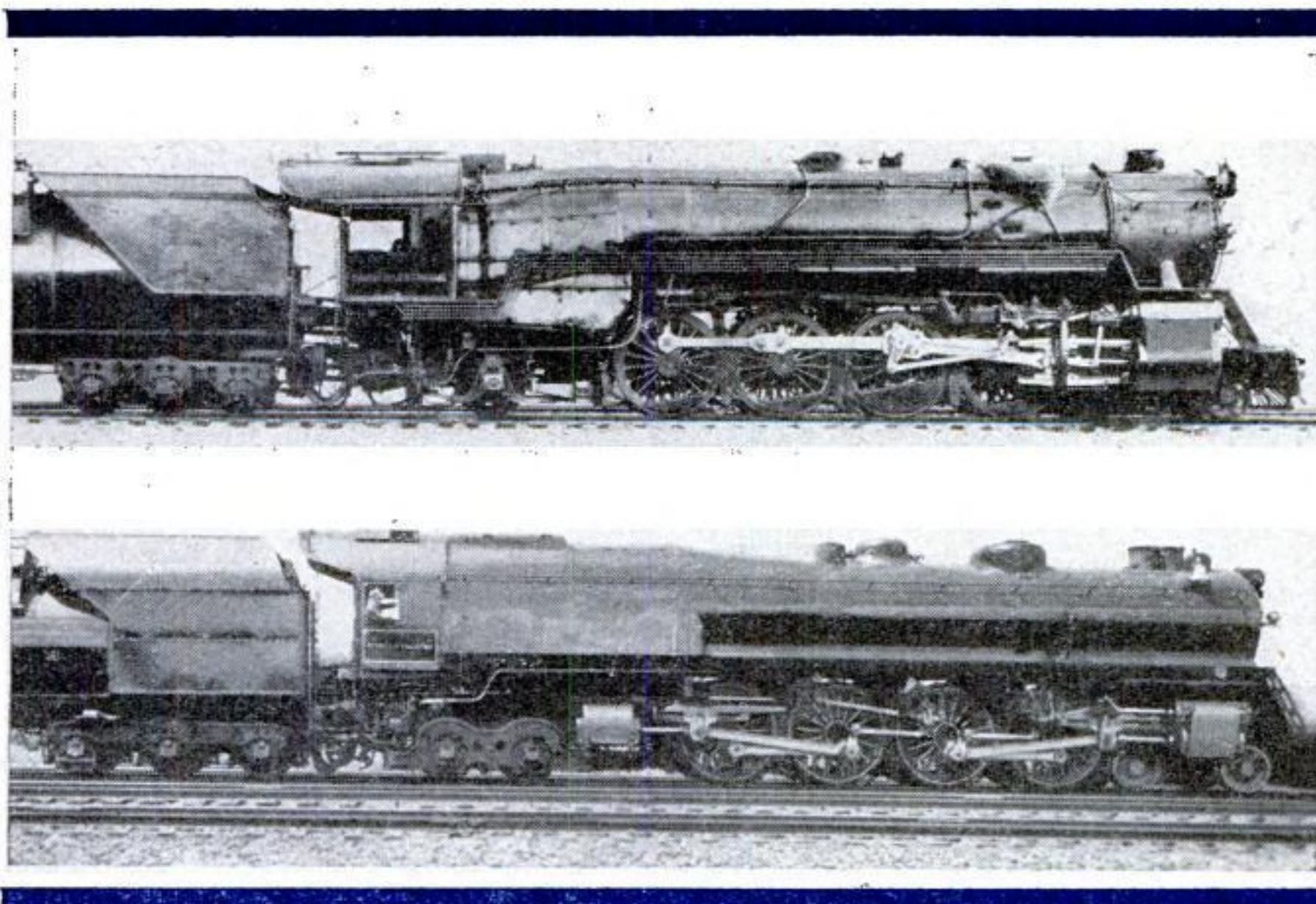
Meanwhile, the Union Pacific Railroad has been experimenting with a still more remarkable steam-turbine

scheme. In this plan, an oil-burning boiler supplies steam to the turbine, the turbine runs an electric generator, and the current from the generator operates electric driving motors on the wheels. Roundabout as it seems, this method of generating power is said to show amazingly high efficiency, and steam-generating units developed for the purpose are declared to be marvels of compactness and engineering ingenuity. First embodied in a pair of 2,500-horsepower steam-electric locomotives, the design is believed to be adaptable to produce engines up to 10,000 horsepower!

Mechanical innovations like these spell more power, better fuel economy, and reduced wear and tear on trackage, for steam locomotives. Put it all together and it adds up to speed—and speed is what the public is demanding, and getting, these days.

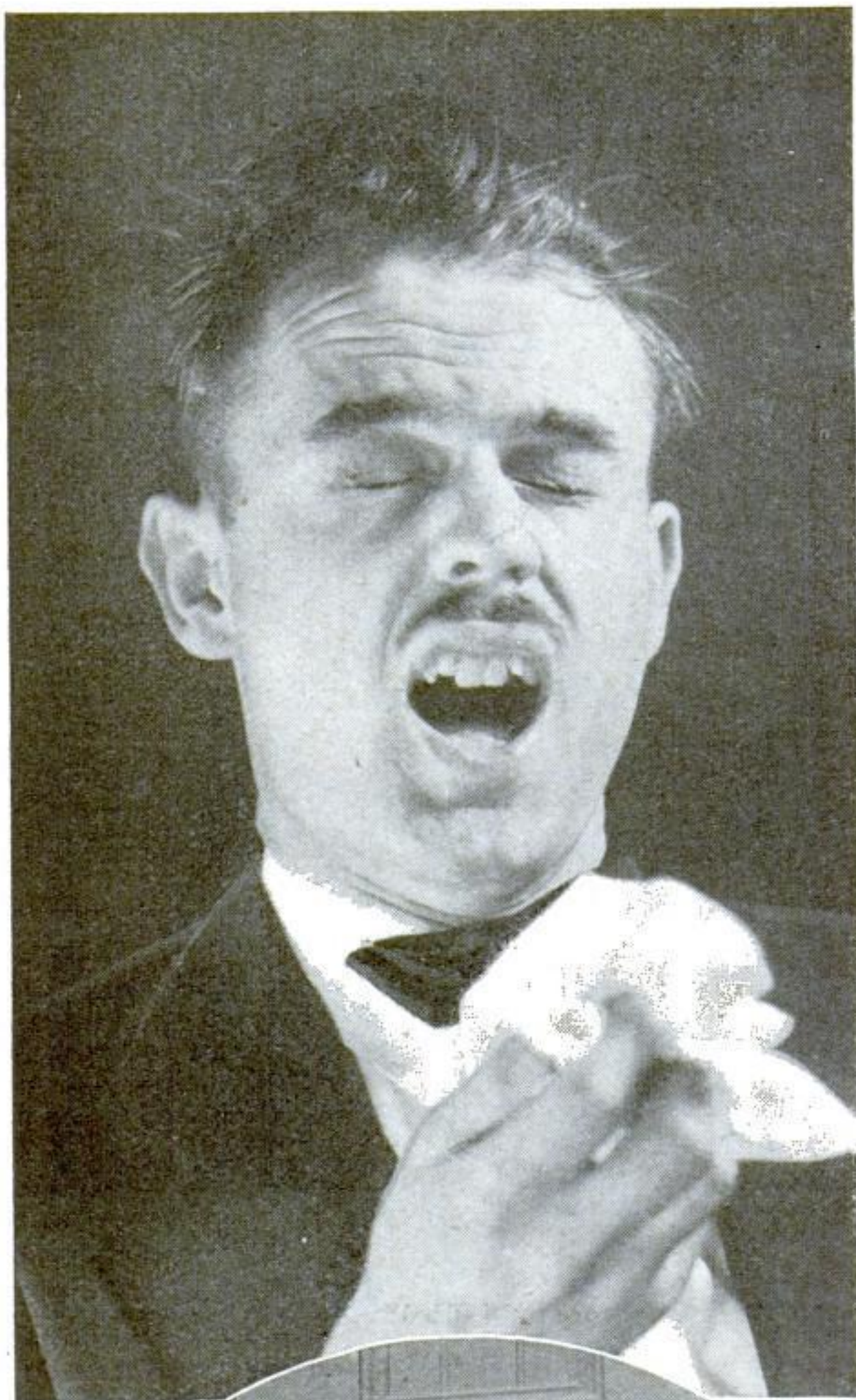
In 1930, just thirty trains in this country were making regularly scheduled runs of sixty miles an hour or better. Today there are hundreds. Despite the speed that streamlining and other modern improvements have recently added to the famous trains of England and continental Europe, we still lead the world in the number of mile-a-minute trains we possess and in the distance they cover at such a pace.

What pulls these crack flyers? In satisfying his curiosity as to what kind of power they used, a statistician (*Continued on page 131*)



Two pairs of cylinders, on the B. & O.'s new "George H. Emerson," make it possible to use lighter driving rods, as seen by comparison with the "Lord Baltimore" above it

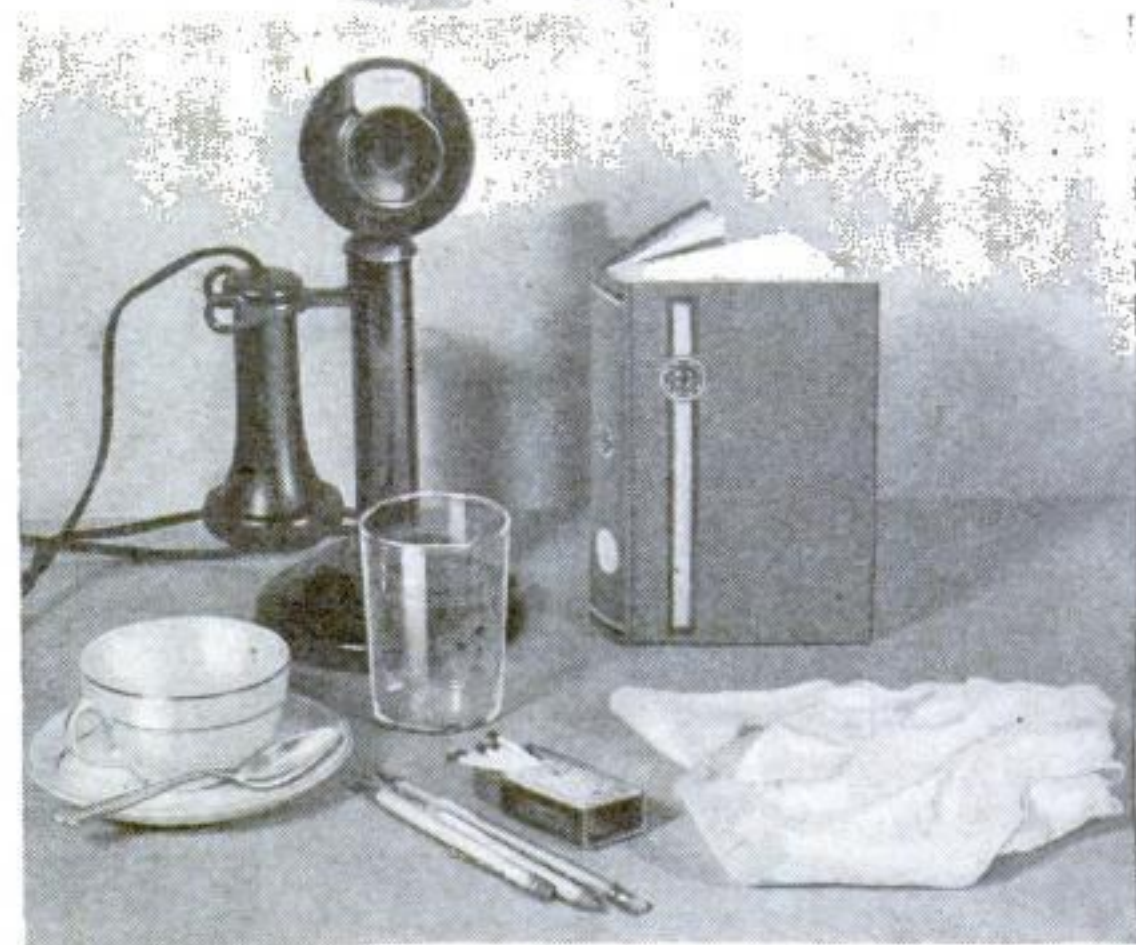
How to Dodge



In bad weather, keep your feet warm and dry, and protect your throat and head. Avoid chills

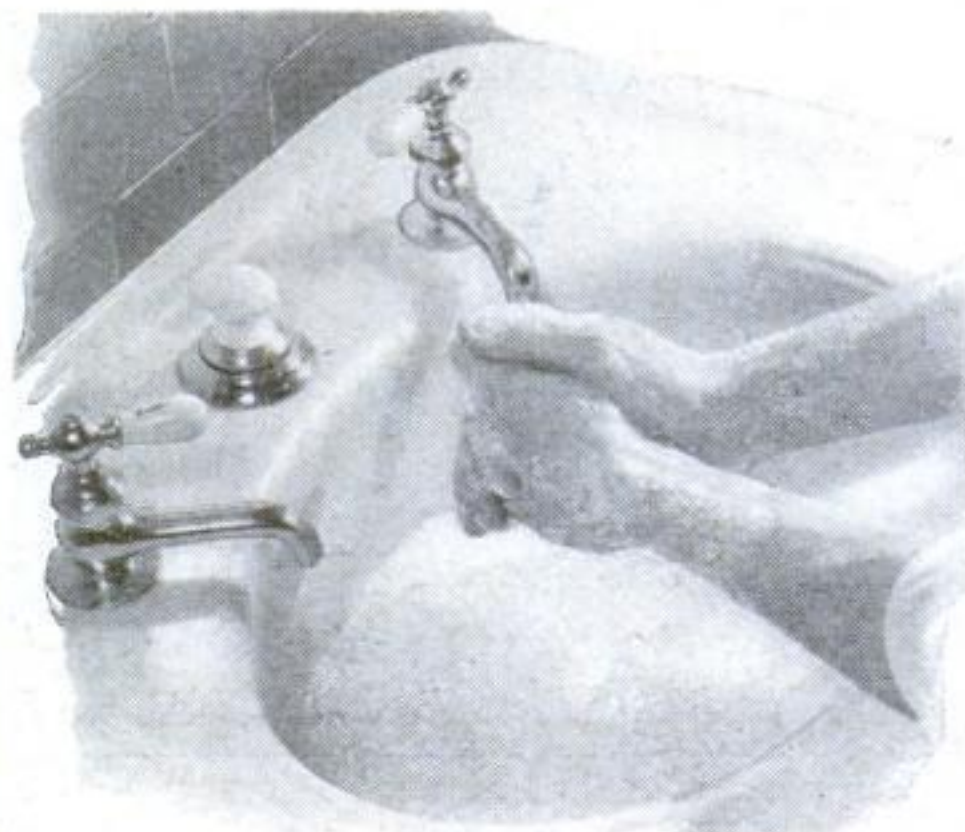
A woman in New York State claims that her family has had fewer colds since she began hanging this sign on her front door during every fall and winter

Dress according to the weather. Consult an outdoor thermometer in the morning and adapt your outer clothing to the temperature it registers



Here are some common carriers of the common cold. The virus may lurk on anything that infected persons use or handle

Wash your hands frequently. Observe this rule particularly before meals and after you have been in crowds or public places



To give readers of **POPULAR SCIENCE MONTHLY** the latest medical opinion on the prevention of the common cold, the editors interviewed prominent physicians, hospital directors, and public health officials. The most important protective measures are graphically illustrated on these pages.



a Cold

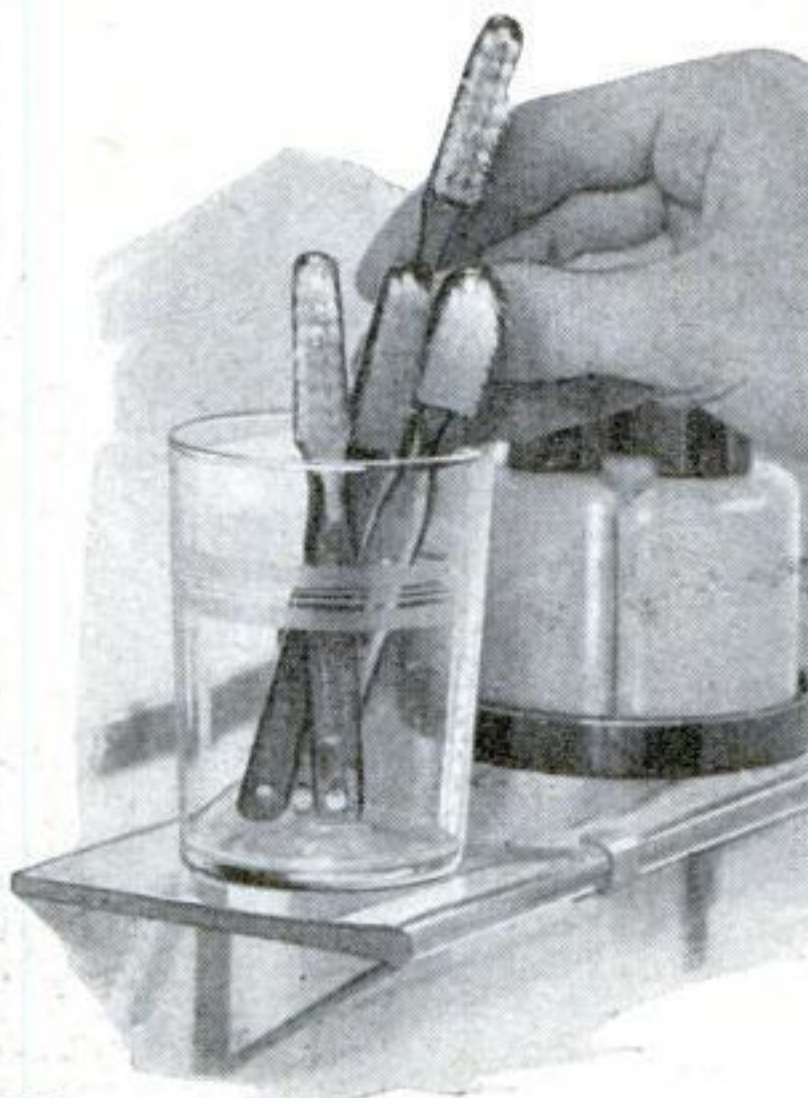
SOME SIMPLE RULES FOR AVOIDING THIS COMMON SCOURGE OF WINTER

PEOPLE in the United States suffer 200,000,000 colds every year. The average attack lasts from five to seven days and costs about fifteen dollars for medicine, doctors' bills, and loss of time from work. Children are the most susceptible to the snuffle scourge, aged persons least. The old adage, "Feed a cold and starve a fever," has absolutely no basis in fact.

These are some of the outstanding facts and statistics concerning the plague of coughs, sneezes, and sniffles that sweeps constantly over the nation in seasonal waves that soar to a yearly high in winter. Although they suspect a tiny, filterable virus, medical experts are not sure of the cause of the common cold and therefore can prescribe no certain remedy. Prevention, they say, is still the best cure.

How can you dodge a cold? Stay out of crowds; get plenty of fresh air, exercise, and sleep; don't overeat; drink lots of water between meals; wash your hands often—these are some of the important measures you can take to stay the onset of the annoying affliction.

Toothbrushes stacked in a common receptacle so that the bristles touch will pass a cold along from one member of a family to another



This is how a Hollywood actor and actress guard themselves against colds while rehearsing movie love scenes



Doctors recommend drinking plenty of water between meals. Eight or ten glassfuls a day are not too much, they say



Stay out of crowds as much as you can. If you have to go, observe every precaution



Keep your fingers out of your mouth. Also avoid biting on pencils, paper clips, coins, and other common articles

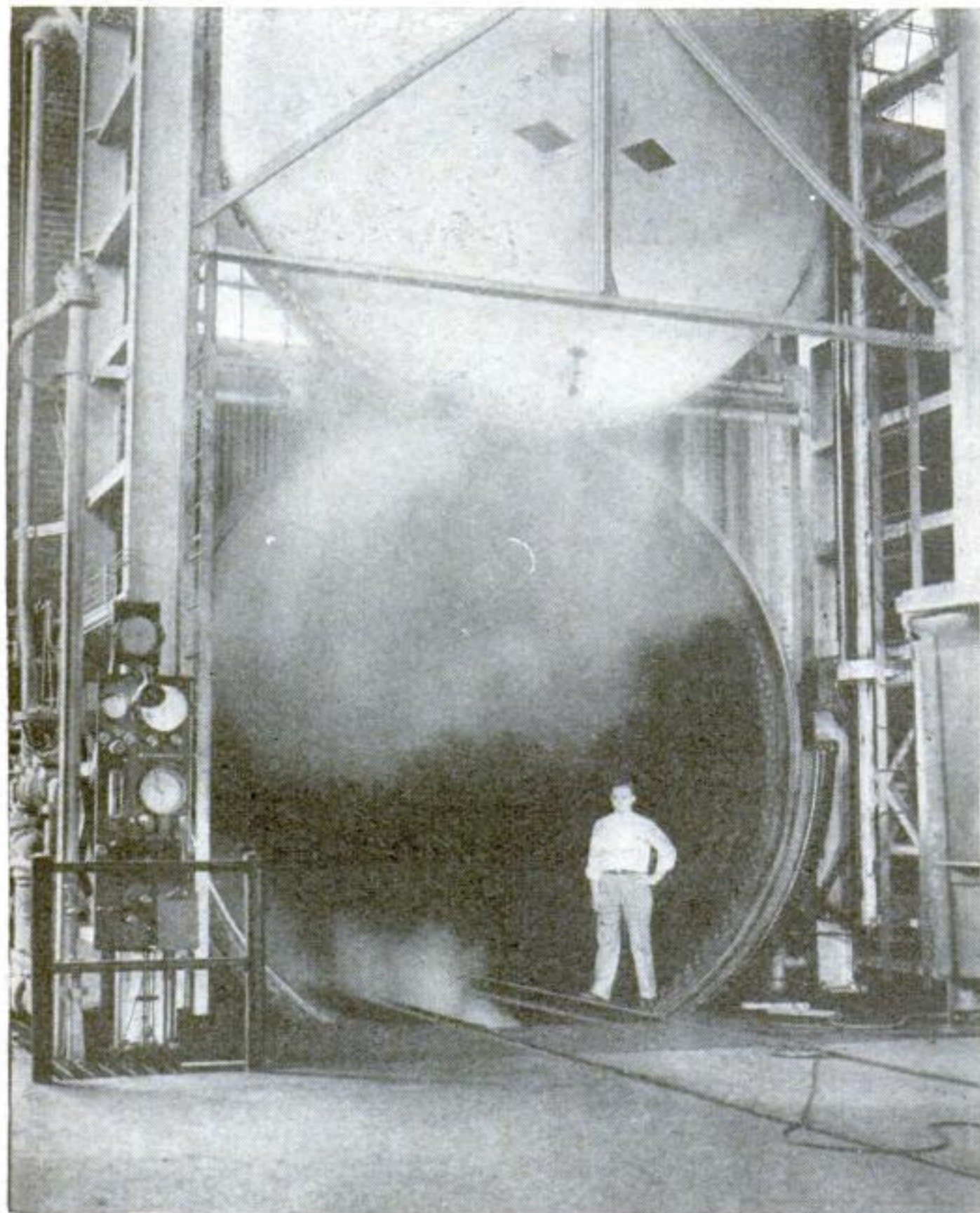
Many simple treatments are recommended for the early stages of a cold. One consists of mild doses of bicarbonate of soda



Diet is an important factor in avoiding colds. Don't overeat, and keep away from too many starchy foods. Eat balanced meals, with plenty of vitamins

Huge Vulcanizer Lines Tanks

WHAT is said to be the world's largest vulcanizer was recently completed for use in curing the rubber linings of giant acid tanks to be employed in the manufacture of steel. After thin sheets of rubber have been applied to the inside of the tanks, they are hauled into the huge vulcanizing cylinder, which measures forty-five feet in length and fifteen feet in diameter. When a ponderous steel door seals the chamber, high-pressure steam produces an interior heat of more than 300 degrees.



Rubber linings for acid tanks are cured in this mammoth chamber

Anchored at wrists and ankles, the cape catches air as seen in drawing below



Cape Brakes Skier on Steep Slides

WORN over the shoulders like a cape, a novel skiing coat of balloon cloth can be opened up to act as a wind brake and retard the wearer's speed while racing down steep hills or runs.

Periscope Aids Study of Underwater Life

UNDERWATER animal life is studied by a Detroit, Mich., naturalist with the aid of a homemade periscope. The instrument has a slanting mirror near the end of a metal tube so that images of underwater objects are reflected to an eyepiece at the top. A flash-light bulb and reflector below the mirror illuminate the object being studied.

Stencil Stamp Fits Pocket

COMPLETE even to a built-in inking pad, a new vest-pocket stamping device makes it easy to print names, addresses, and similar information in duplicate. Signatures, printing, or typed material can be quickly cut into a small stencil which is then placed under a frame bordering the inking pad.

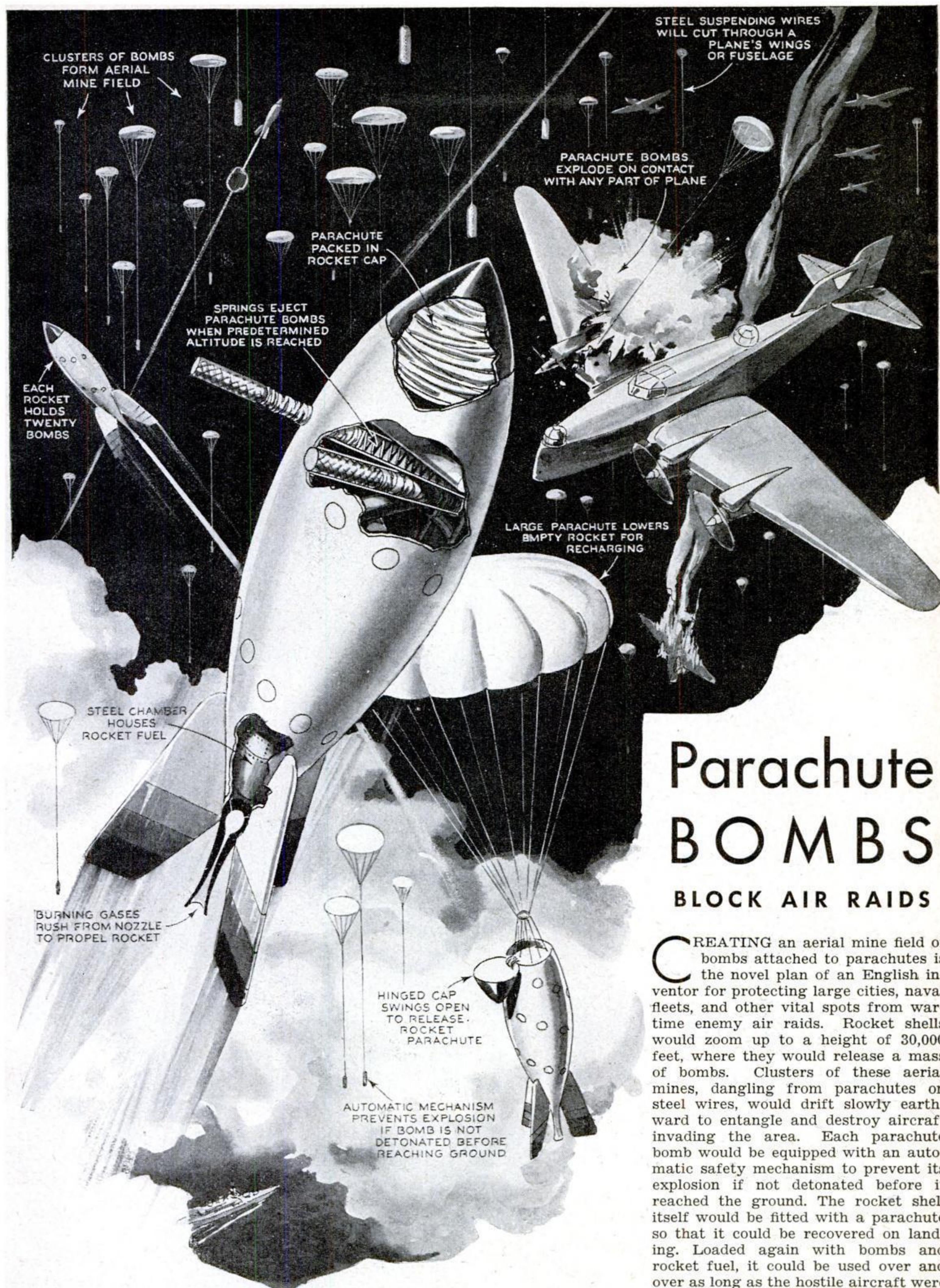


Naturalist using underwater periscope. At the left is a close-up of the homemade device



Double Spool for Yarn Prevents Tangling

IN KNITTING or crocheting two different yarns at the same time, a new device invented in Germany prevents entangling or knotting of the threads. Wound around two spools that turn on a central pin set into a weighted base, the yarn is threaded through a guiding eyelet and flows freely to the work without becoming snarled.



Parachute BOMBS

BLOCK AIR RAIDS

CREATING an aerial mine field of bombs attached to parachutes is the novel plan of an English inventor for protecting large cities, naval fleets, and other vital spots from wartime enemy air raids. Rocket shells would zoom up to a height of 30,000 feet, where they would release a mass of bombs. Clusters of these aerial mines, dangling from parachutes on steel wires, would drift slowly earthward to entangle and destroy aircraft invading the area. Each parachute bomb would be equipped with an automatic safety mechanism to prevent its explosion if not detonated before it reached the ground. The rocket shell itself would be fitted with a parachute so that it could be recovered on landing. Loaded again with bombs and rocket fuel, it could be used over and over as long as the hostile aircraft were within range. Rocket-sending stations at increasing distances around cities would provide several defense lines.

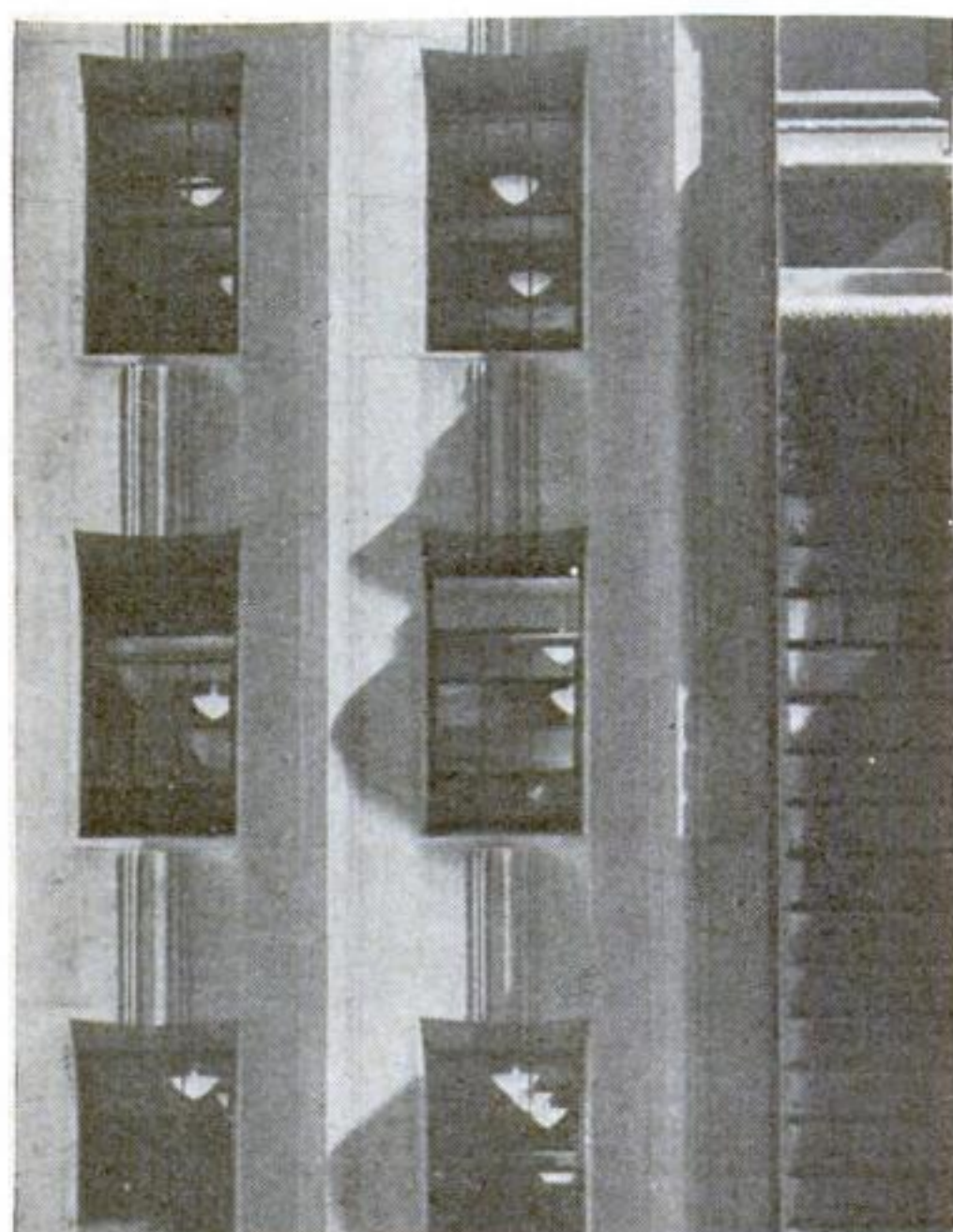
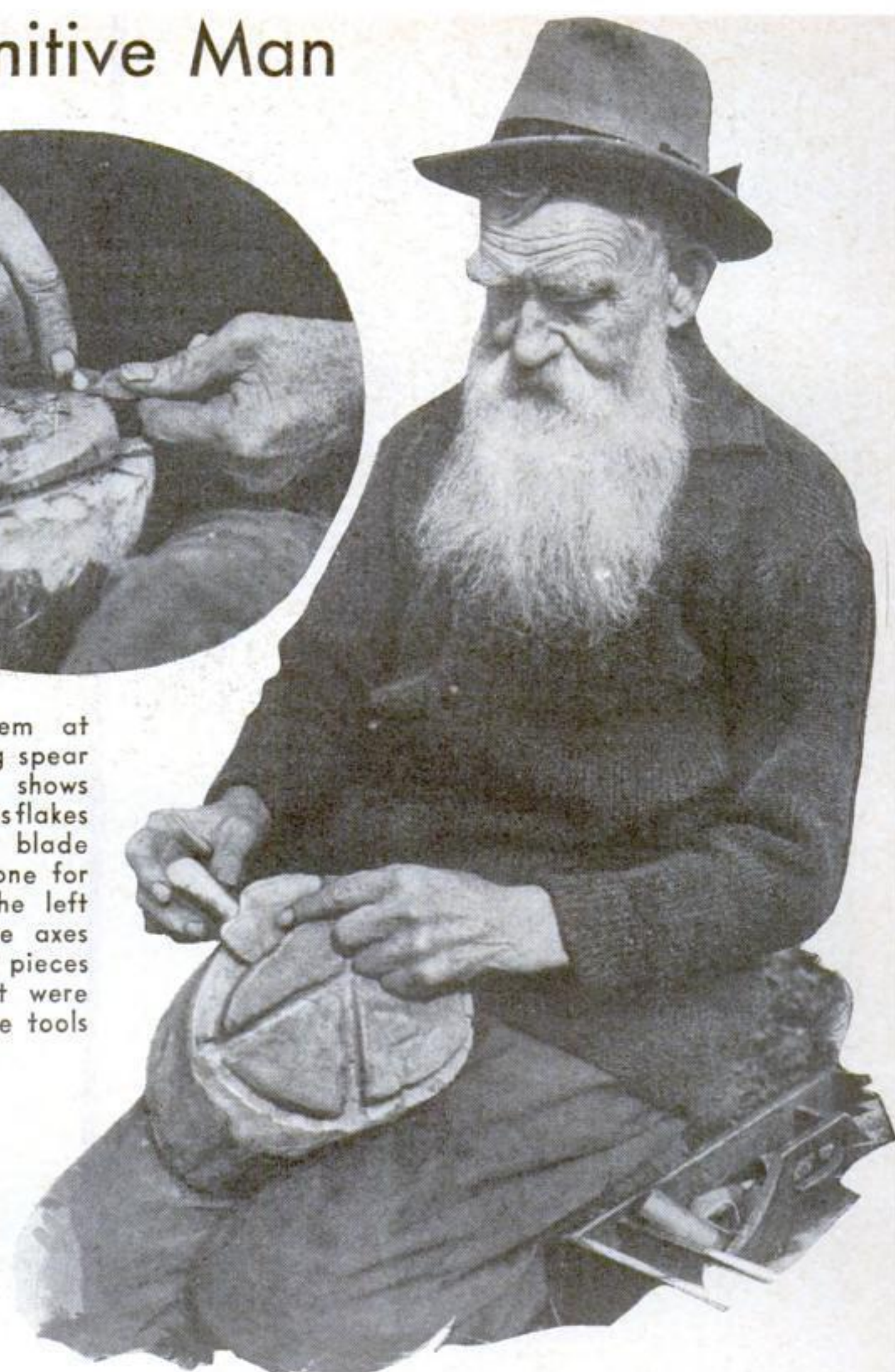
Our artist's conception of an air raid on a naval fleet, with an aerial mine field of parachute bombs scattered by rocket projectiles to entrap the attacking planes. This method of anti-aircraft defense also would protect cities and strategic centers

Hobbyist Makes Tools Like Primitive Man



H. L. Skavlem at work on a big spear head. Circle shows how he removes flakes from a flint blade with a dry bone for a tool. At the left are two stone axes he made, and pieces of wood that were cut with crude tools

FASHIONING ancient tools and weapons just as it was done by primitive man is the unusual hobby of ninety-one-year-old H. L. Skavlem of Wisconsin. Using only animal bones for tools, a tree stump for a workbench, and a stone for an anvil, he has made thousands of spear points, stone fish hooks, and stone axes. Mr. Skavlem is said to be one of the few modern white men who have ever mastered the difficult art of working flint. Two stone axes he made are shown above.



President's Profile Seen in Odd Shadow

OFFICE workers in the financial district in New York City were startled recently by a giant shadow resembling a man's face, which was cast on the side of a Wall Street skyscraper by adjacent buildings that blocked out some of the sun's rays. About twelve feet in height, the odd shadow pattern, shown in the photograph above, bears a striking resemblance to the familiar profile of President Roosevelt.

Camera Catches Plane at Moment of Crash

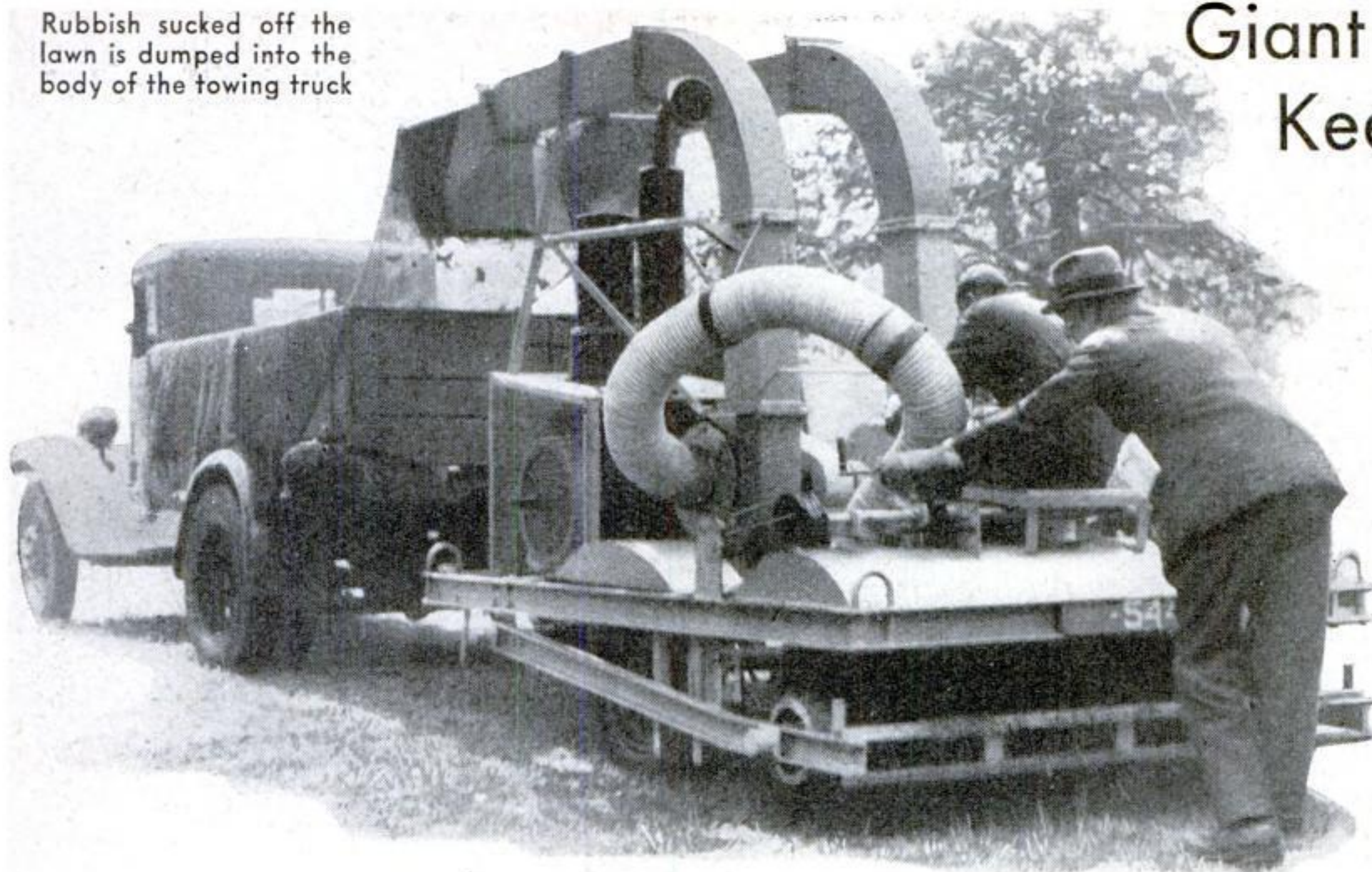
SNAPPED the instant before the crash, the remarkable photograph at the right shows a British airplane pilot being catapulted from the cockpit as his craft plunged to destruction. The pilot somersaulted down the side of a cliff and through the roof of a building. Contesting in an air race, he had swooped low to be identified, when his plane was caught in whirling air currents.



In this remarkable picture, you see a pilot being hurled from the plane as it swoops downward

His companion's body was found in the wreckage, pictured at the left

Rubbish sucked off the lawn is dumped into the body of the towing truck



Giant Vacuum Cleaner Keeps Parks Tidy

REMOVING rubbish and litter from extensive areas in public parks is made easier by a giant outdoor vacuum cleaner tried out recently. Hauled behind a dump truck, the unit has a powerful motor that creates a vacuum to suck up bits of paper, cigarette butts, and other trash from the park lawns. The litter then is carried through pipes and dumped into the truck body.

Ozone Preserves Food

OZONE, a special form of oxygen commonly employed for bleaching and for sterilizing water, may find widespread use in preserving food. In recent tests, eggs and meat stored in ozone were found to be protected against deterioration for long periods of time.

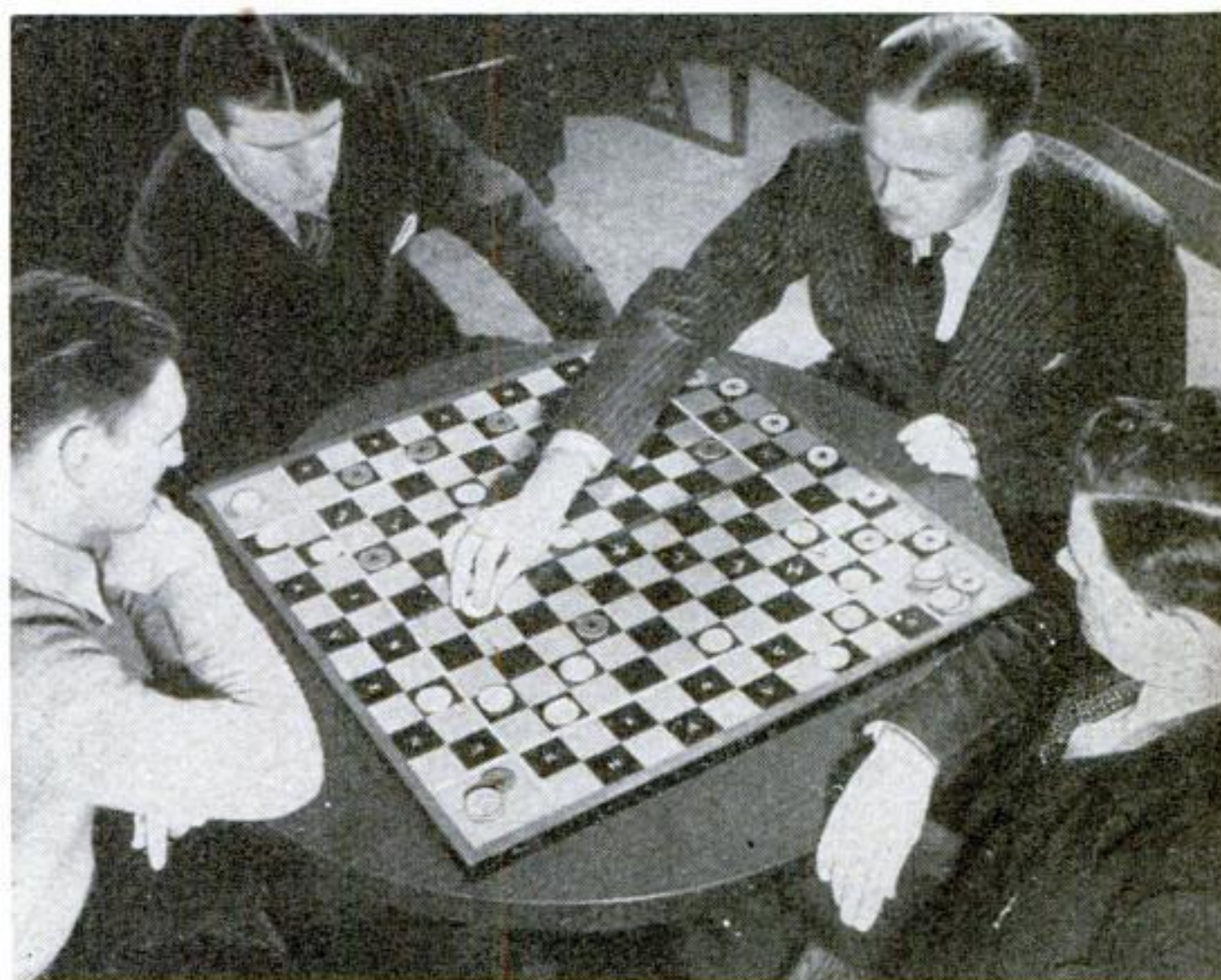


Strange Barking Bird Invades City Home

FLYING through a window into a Brooklyn, N. Y., home, the bird pictured above startled the householder by emitting a doglike bark. The barking bird later was identified as a bittern, rarely seen in large cities. Its long bill gives it an effective weapon of defense.

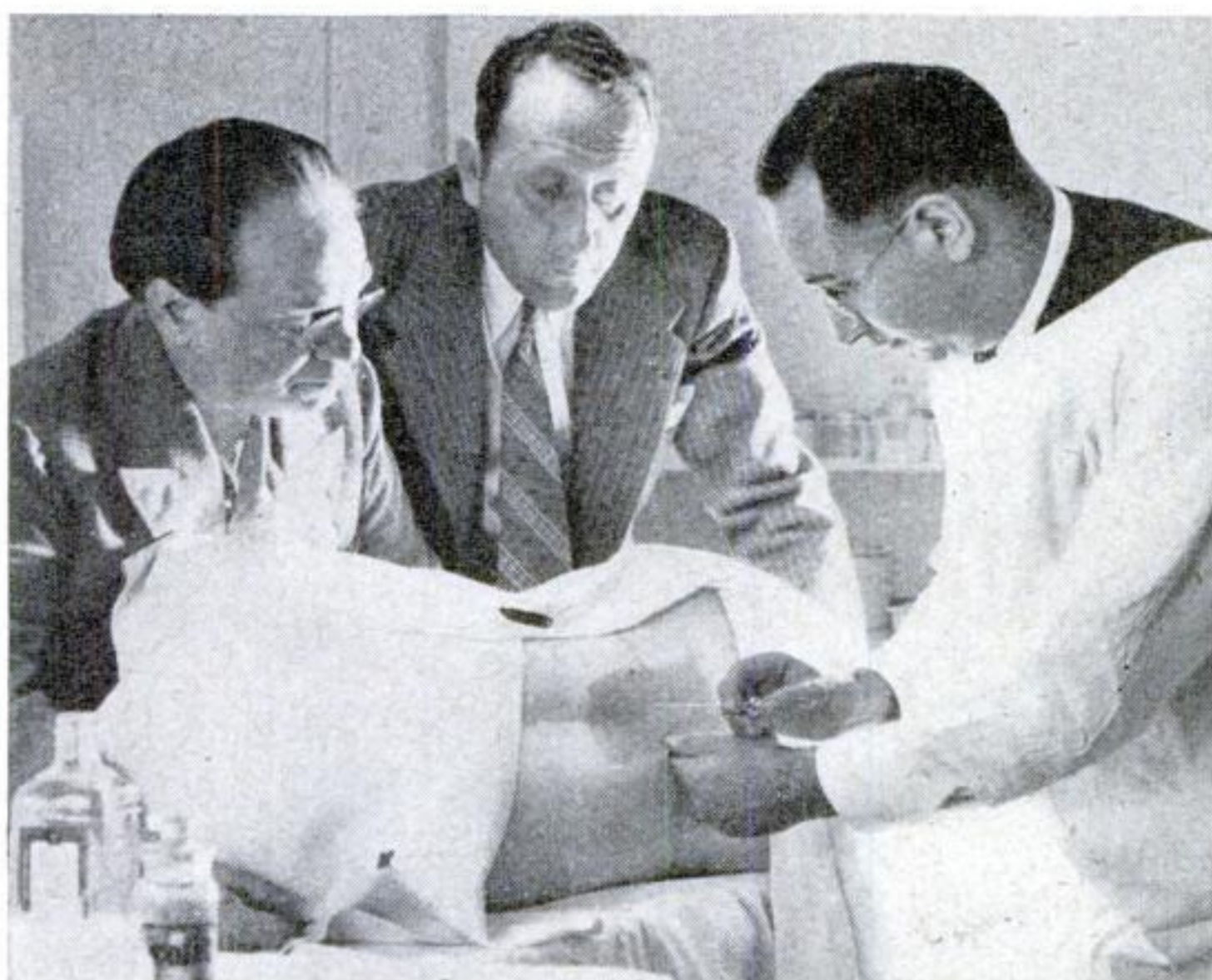
Four Can Play Checkers on New-Type Board

FOUR persons can play checkers on a novel board devised by a Baltimore, Md., inventor. Players sitting opposite each other act as partners, each contestant using separately colored pieces. Although moves and jumps are made in the conventional manner, a player may jump either or both of his opponents' men in the same move. If one partner is eliminated, the survivor moves alternately with each of his opponents. Speaking is barred while the game is in progress.



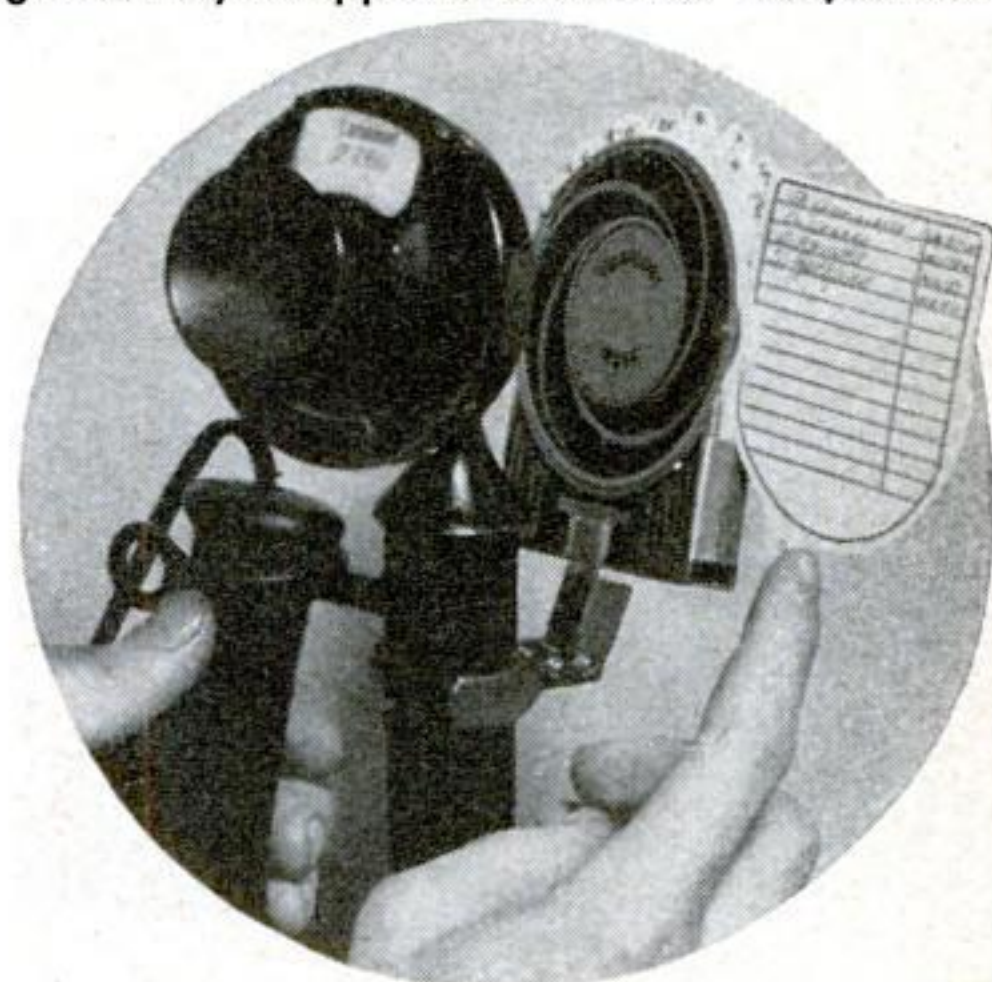
A four-hand checker game. Players opposite each other are partners

Tests Check Theory That Crime Is a Disease



TO CHECK the theory that criminality is a disease, medical experts in Chicago, Ill., are conducting a series of tests on prisoners in the Cook County jail. Individual studies are being made on nine habitual criminals who have voluntarily submitted themselves to the tests. The photograph at the left, taken in the prison hospital, shows a physician extracting fluid from the spine of a subject for purposes of chemical analysis and for comparison with that of normal persons.

Physician extracting fluid from the spine of a criminal for analysis



Phone Index Is Compact

CLAMPED to a telephone, a compact index is a handy accessory for quickly locating numbers frequently called. Cards marked alphabetically and pivoted at one edge can be quickly flipped in-to view. Rubber-covered attachment clamps prevent marring the phone.

ELECTRICITY SETS

The Design of Your Necktie, Scarf, or Golf Hose May Have Come from a Pattern Traced by Electrons on the Screen of a Television Tube



A PATTERN FROM THE LABORATORY

A matching scarf, hat trimming, and handbag, with the original pattern as it appeared in a cathode-ray tube

TELEVISION TUBES, flashing novel patterns on fluorescent screens, are producing new designs for fabrics, shoes, neckties, pocketbooks, and even jewelry.

This by-product of research comes from the world's largest television laboratory, the experimental workshops of the Radio Corporation of America in New York City. Here, C. E. Burnett, of the engineering staff, has been recording on photographic film the striking and novel patterns which form on the screen of a receiving set when ordinary current, instead of television impulses, is fed into the cathode-ray tube. The electronic bombardment of the screen creates patterns in light and shade, which vary according to the frequency of the current reaching the tube.

While the images are visible, Burnett opens the shutter of a studio camera focused upon the screen. By giving fifteen-second exposures and using panchromatic film, he is able to photograph the television designs. The negatives which he has assembled show novel combinations of zigzag lines, plaids, bands of parallel dots, and weaving, chainlike patterns.

Fabric designers, both here and abroad, are interested in the television patterns. They are expected to find a place in the design of wall paper, curtains, print fabrics, upholstery materials, imitation leathers, blankets, neckties, scarfs, sport hats, and laces.

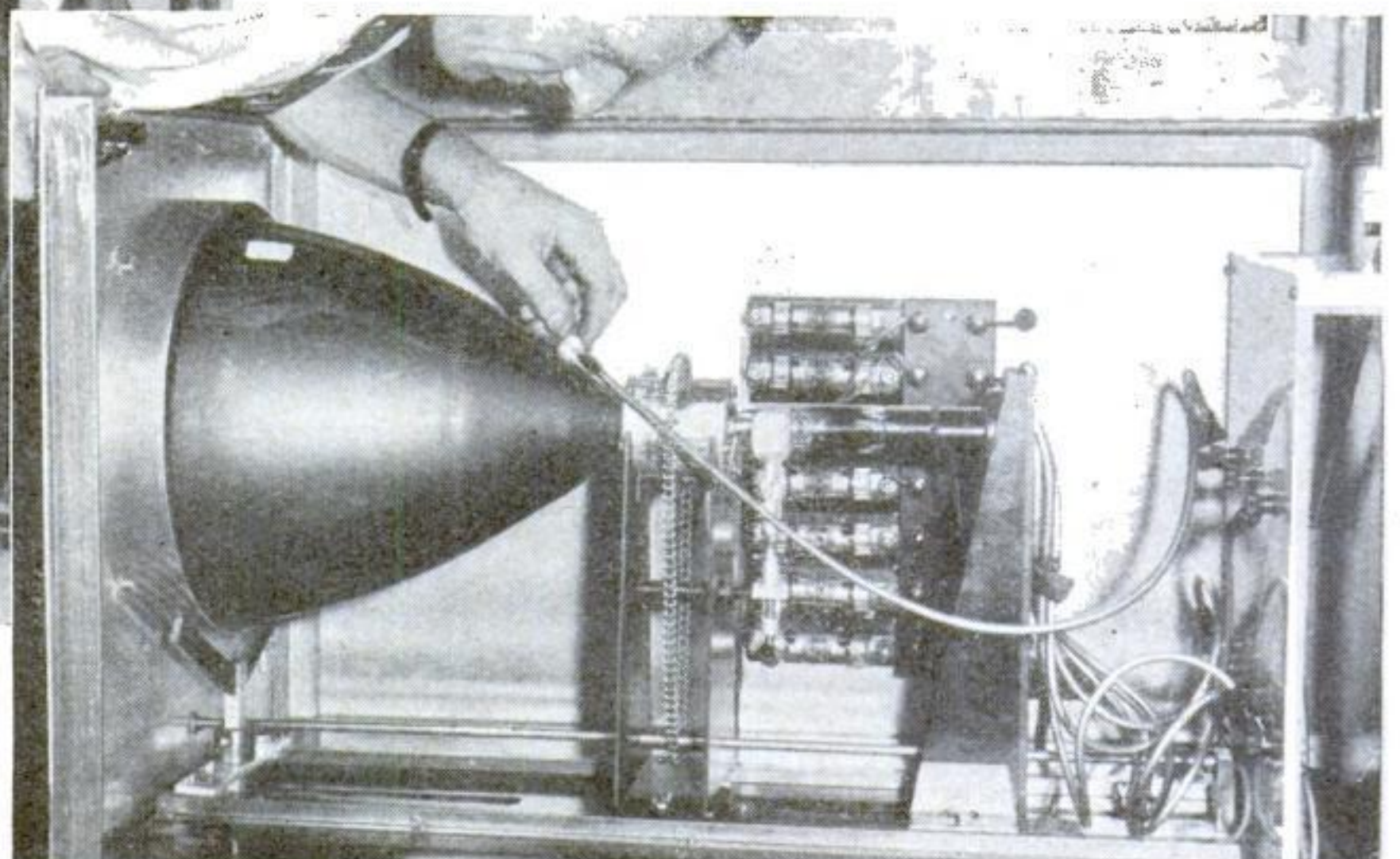
Interior decorators are trying out the novel patterns on lampshades and hangings for modernistic apartments. Jewelers are planning to utilize the new designs in the making of bracelets, rings, and cuff links. Shoe manufacturers are interested in the possibilities of using at least one of the patterns in producing imitation leather for women's shoes. This particular combination of light and dark spots creates the effect of snakeskin.

Another field in which the electronic designs may find wide application is in the packaging of merchandise. Attractive labels and cartons can be produced by the use of television patterns. In fact, the work at the New York laboratory has opened up a whole fresh field of unusual and striking designs which may prove of value in many branches of industry.

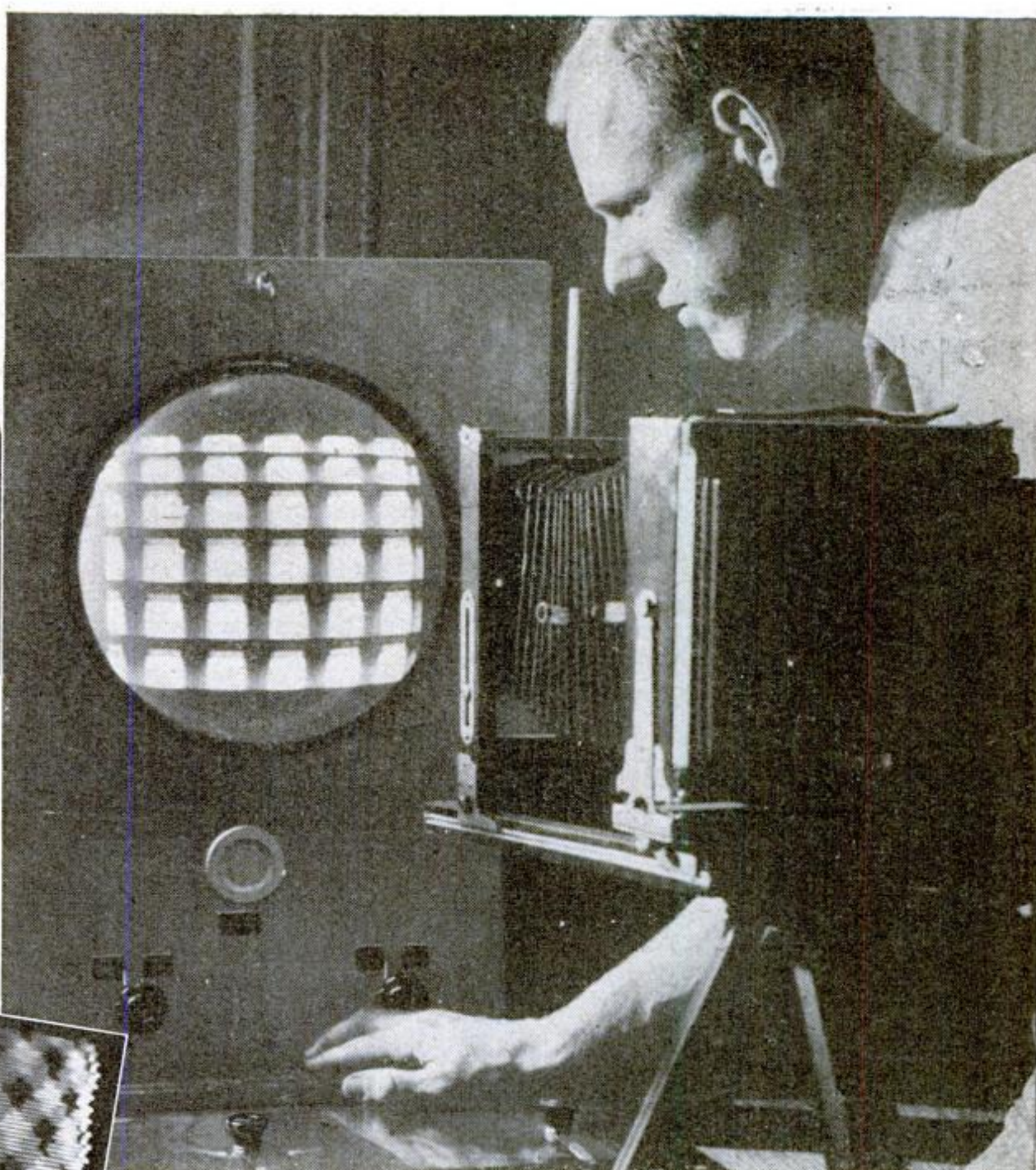
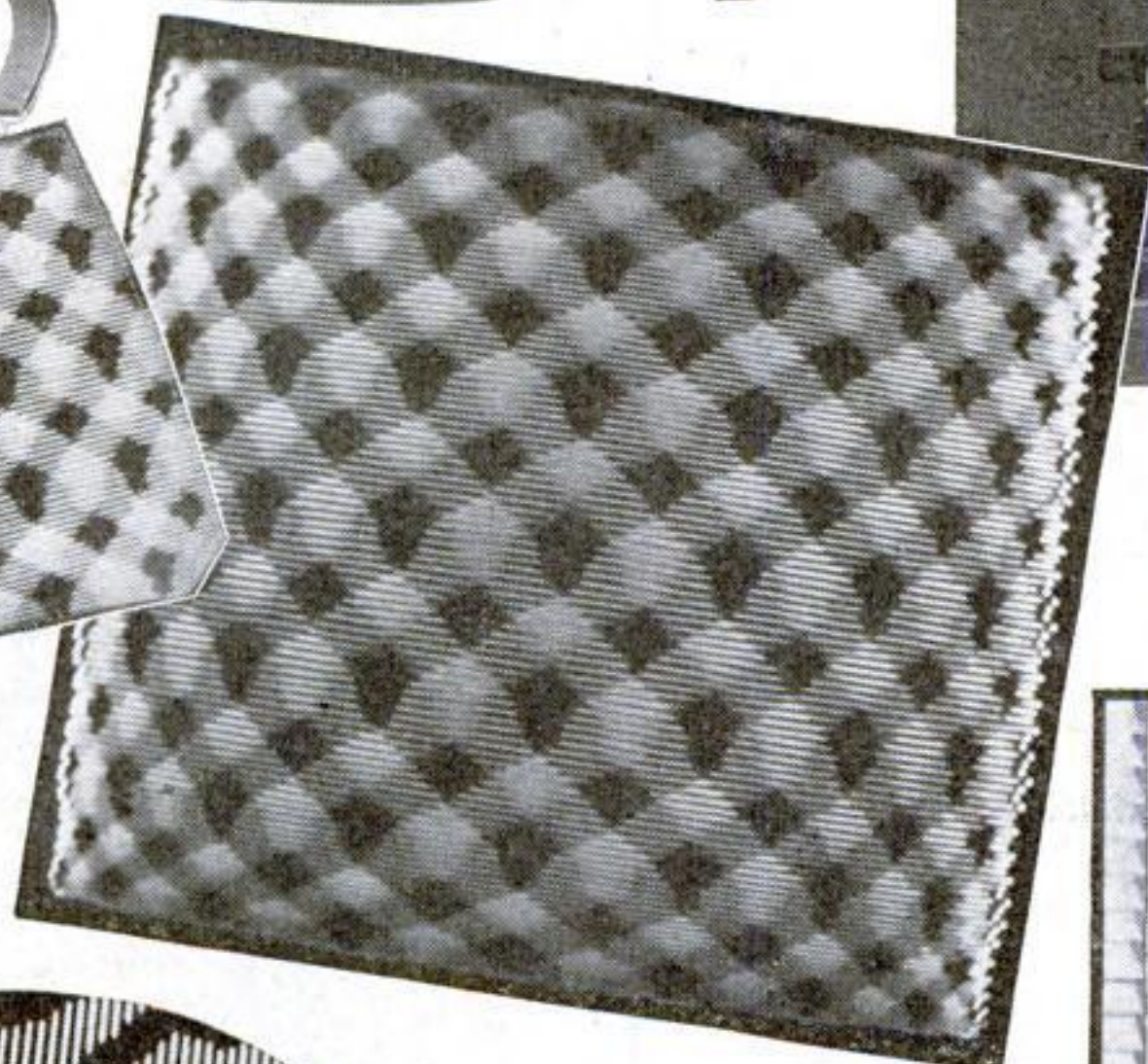
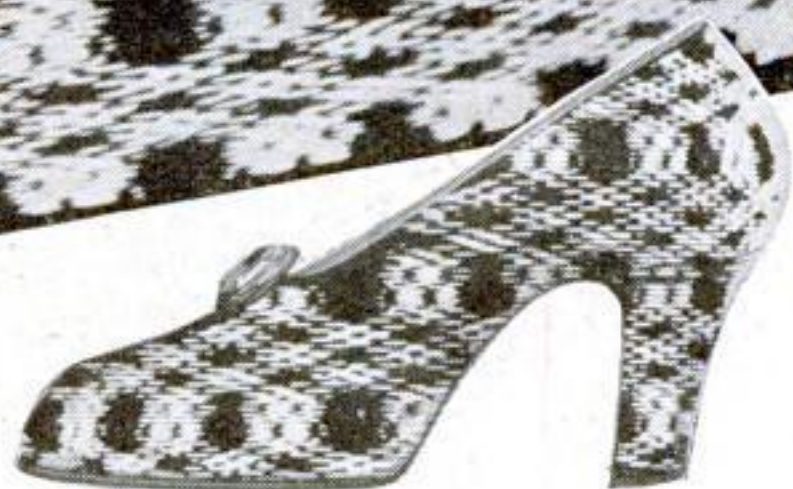
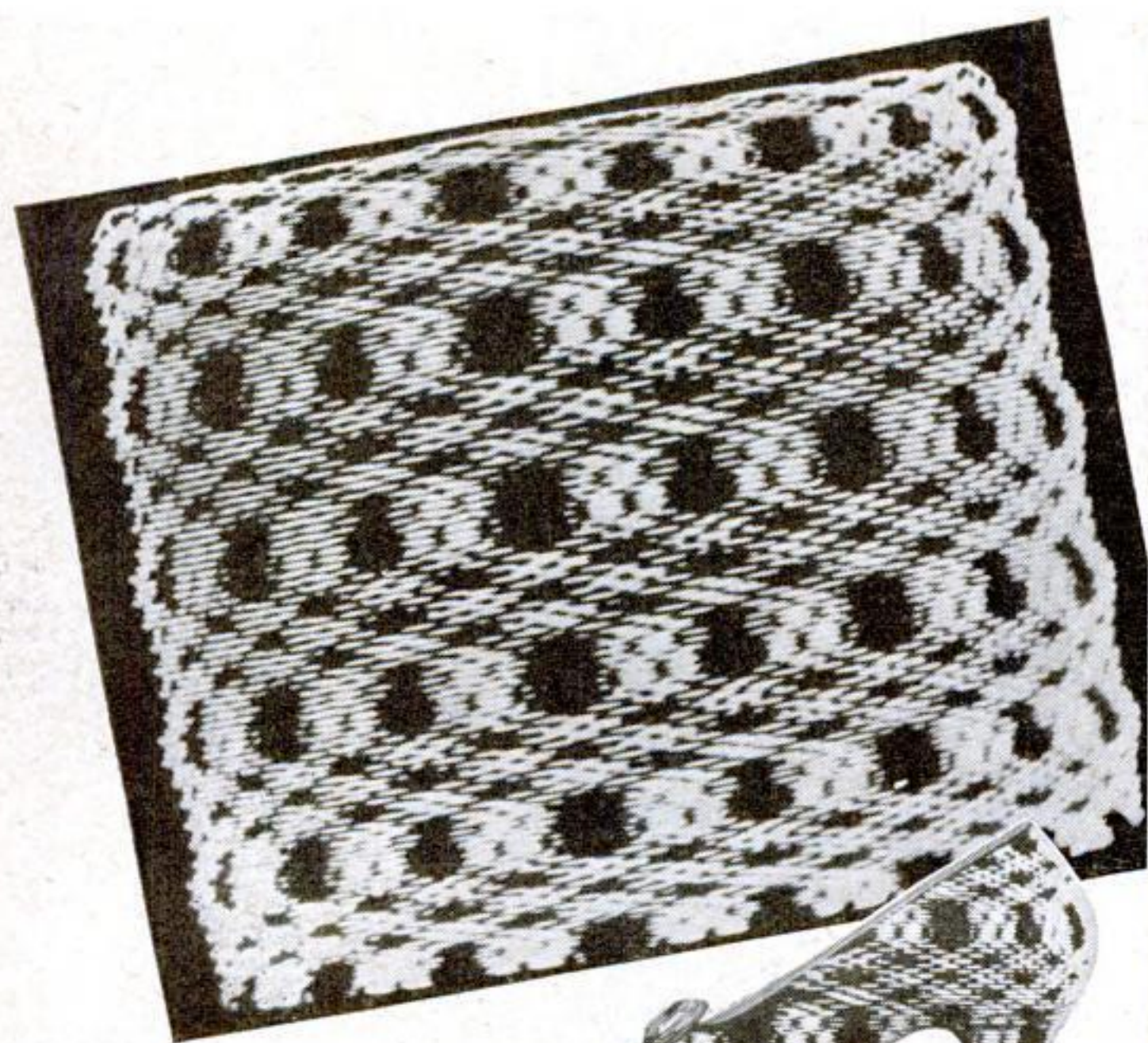


HOW ELECTRONS TURN ART DESIGNERS

The bottlelike objects are television receiving tubes. At the right, such a tube is mounted in a cabinet with its fluorescent screen against the opening on the left



THE FASHIONS

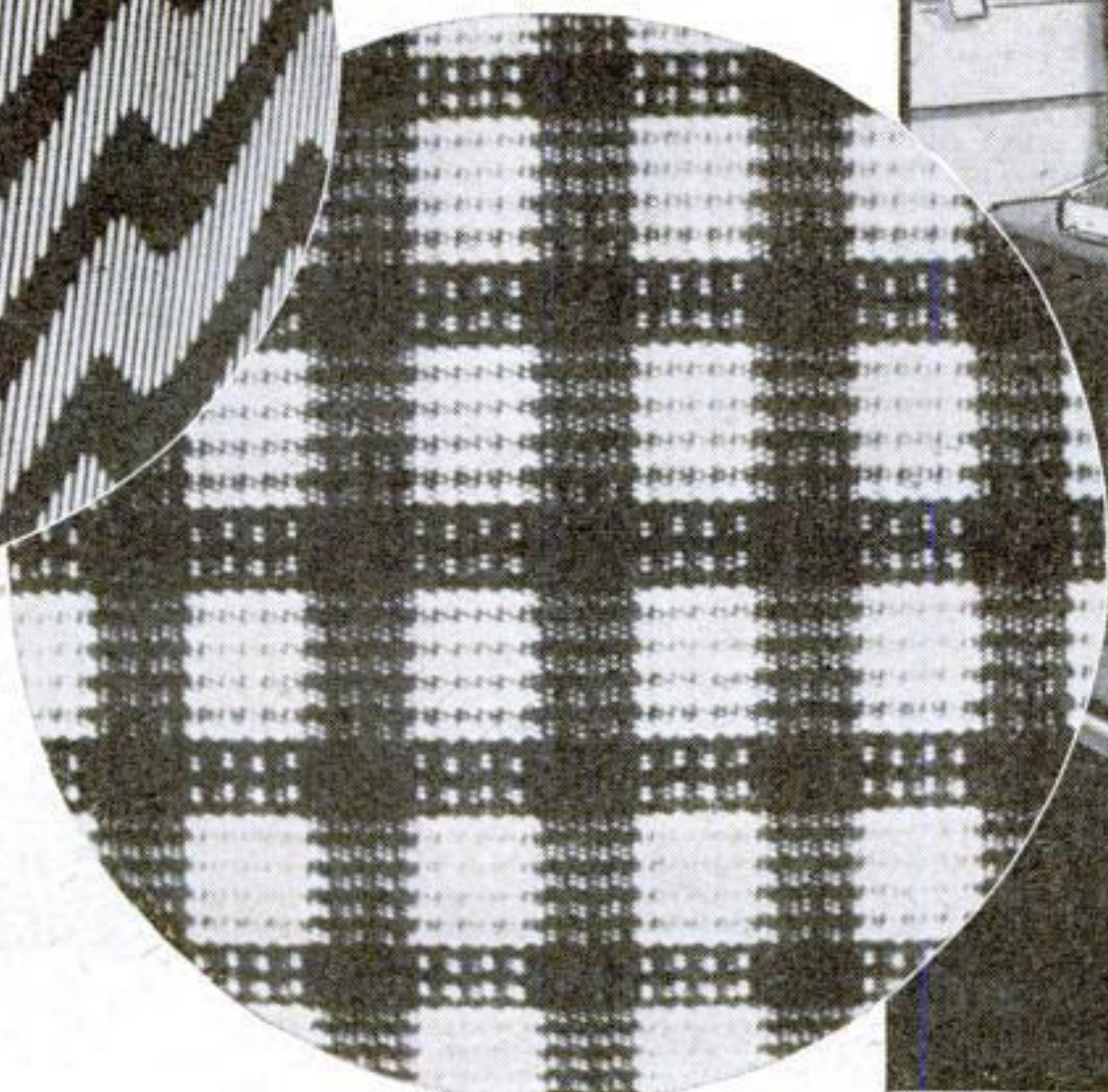


PHOTOGRAPHING ELECTRIC PATTERNS

C. E. Burnett regulating the frequency of the current in the tube. When a desirable pattern appears on the screen, he opens the shutter of the camera and records the design in a photograph

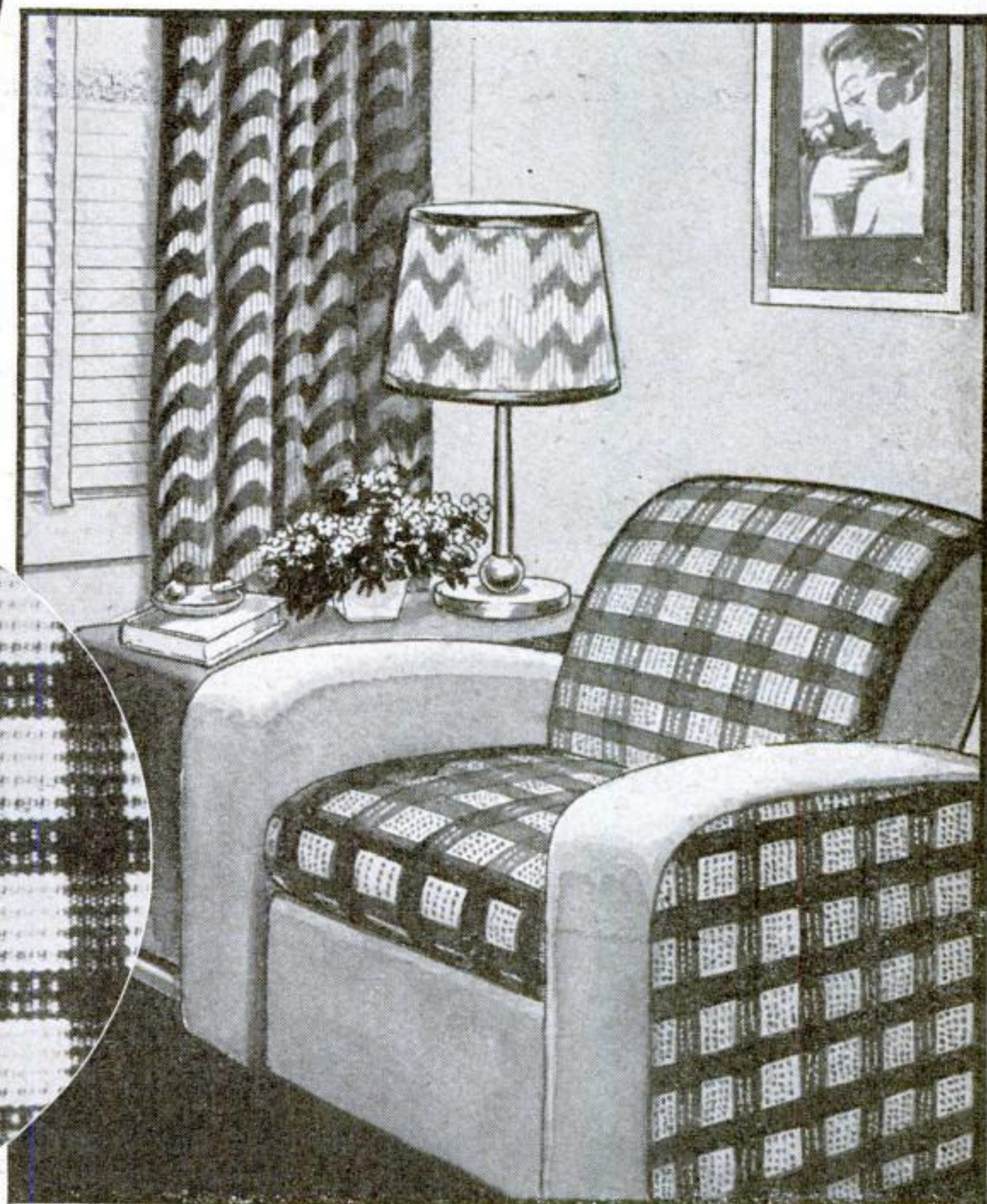


A shoe of artificial snakeskin, and a hand-bag, with the cathode-ray-tube patterns that inspired their design



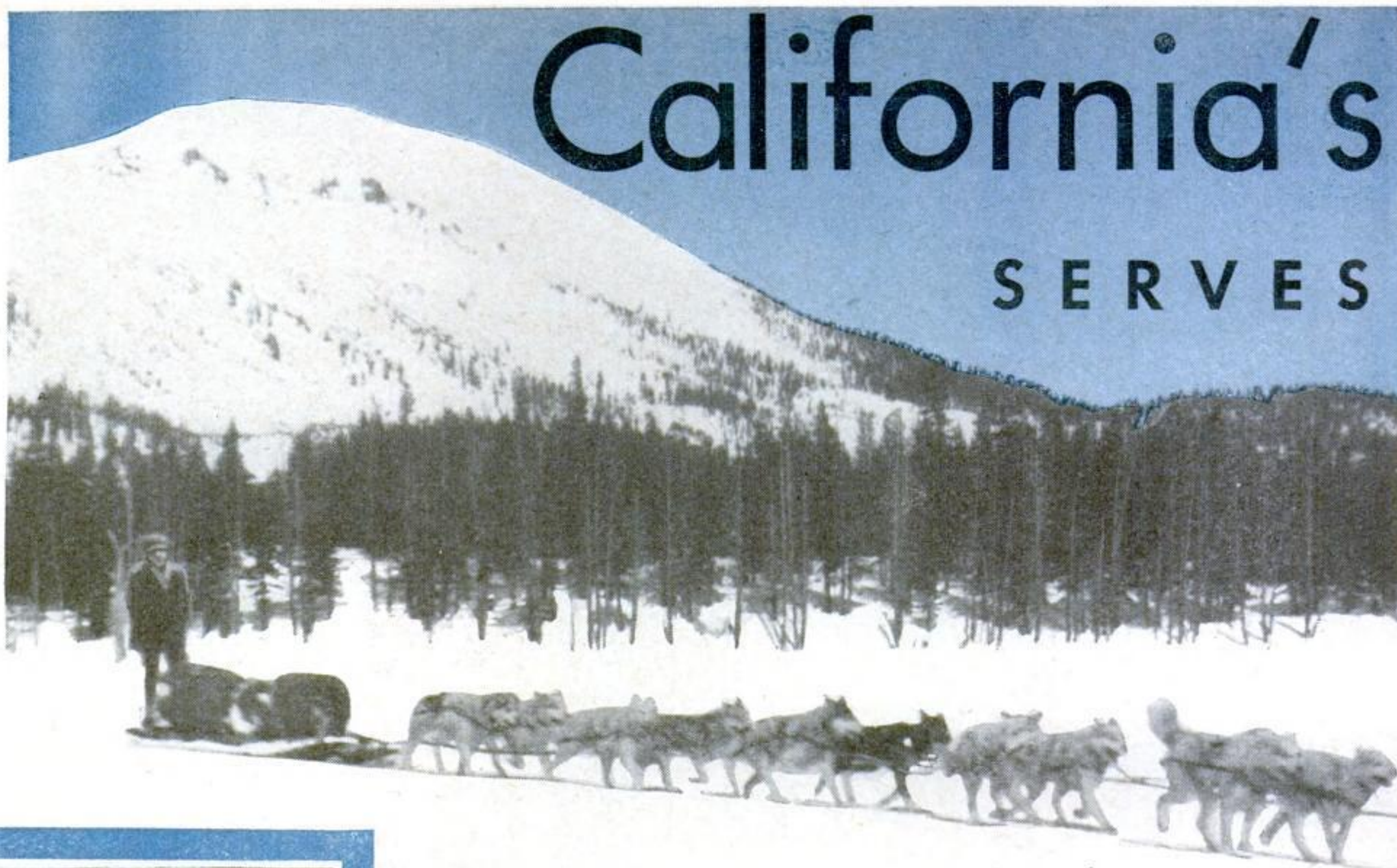
INTERIOR DECORATING

Curtains, lamp shades, and upholstery for modernistic apartments are influenced by the new style. Note how the two patterns above are used in the drawing at the right



By
STERLING
GLEASON

Tex Cushion on the trail with his team of Greenland Male-mutes. He is seen below in his fur-trimmed parka and steel storm goggles



California's SERVES

Braving the Fury of Mountain Blizzards, Tex Cushion Carries Supplies to Isolated Communities With His Team of Faithful Huskies

they had been settled a month in their new home, they had adopted the dogs, left behind by a motion-picture man who had kept but one out of a litter bred in his kennels.

Under Tex's care, the young pups prospered and began to show their natural aptitude for sled work. Before long, they had learned to work so well together that Tex took his first dog-team contract—to haul ice from the high mountain lakes, down to lower altitudes, where it was stored for use in lodges and resorts the following summer.

High up in the mountains, men were operating a mine despite the approach of winter. But unless supplies could be brought in occasionally, they would have to shut down. A local packer carried in a few loads on his back, until the snow got too deep. Then he quit.

One of the mine's engineers sought out Tex and asked him to try hauling in the needed supplies with his dog teams. Old-timers warned him that it would be impossible. The country was unsuited to dog-teaming—the dogs could not get through. The passes were full of snow, storms raged in the hills, and he did not know the way. But Tex had faith in his dogs. He promised the engineer to do his best.

Tex's wife insisted on accompanying him. A rough map sketched by the engineer was the only key they had to the completely obliterated trails of an unknown district. If they could reach a little cabin at the Devil's Post Pile, they would find some supplies left by a ranger. Beyond there, the country

was blind for the rest of the journey.

With the woman breaking trail, they plunged into the wilderness of newly fallen snow, sixteen dogs pulling a crudely fashioned sled loaded with 900 pounds of mail and supplies. All that day they struggled up the steep grades. It was nearly nightfall when they reached the little cabin, where they removed the harness from the tired dogs and fed them from the meager supplies they had brought along. The food left by the ranger had disappeared, and only a sack partly filled with barley hung from a rafter.

"Well," said Tex, "if we are stuck here for a time, we can have a lot of good barley soup." Not until later did he learn of his narrow escape. The barley was poisoned, for use in rodent control.

By morning, snow began falling again, but after eating what little food remained, they started on. The snow became heavier, turned to sleet which rattled on their steel-covered goggles like machine-gun fire. The sleet changed to heavy snow, with a gale driving it. Its swirling whiteness blotted out trees and at times swallowed up the leading dogs from view.

At the mine, 11,000 feet above sea level, the miners were reconciling themselves to a lean, cheerless Christmas, with rations running short and no news from home. Suddenly, outside, there was a jingling of bells, a chorus of excited yelps, and into the clearing came Tex's dog team, drawing a sled piled high with supplies and—better yet—sacks of mail. Santa Claus himself couldn't have been more welcome.

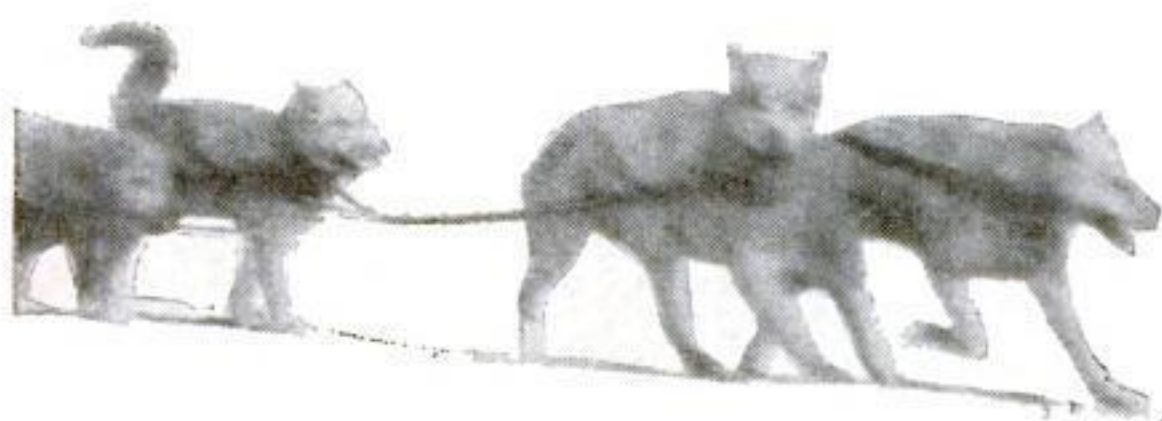
That was several years ago. Since

IMAGINE finding your greatest joy in battling icy gales in wind-swept passes, your greatest thrills in braving the blinding fury of mountain blizzards, with their driving snows, hail, and sleet! That is the unique job of Tex Cushion, who operates what is believed to be the only commercial dog-team freight line in the continental United States. With his wolf-dog pack, twenty-six superb Greenland Male-mutes, he spends the stern Sierra winters struggling over trails buried many feet under mountain snows as he brings supplies to isolated camps and communities, mail to snow-bound miners and lonesome settlers, and first aid to the injured.

A few years ago, while vacationing in the high Mammoth Lakes country of California, Tex and his wife saw a spot that appealed irresistibly to them as a place for a home. Perhaps the sight of six or seven young sled dogs, just puppies, abandoned and in need of care, had something to do with it. Before

Dog-Sled Express

SNOW-BOUND SIERRAS



then, Tex's dogs have become an institution in the winter life of these mountain regions. Behind his well-trained teams, mine owners, radio men, assayers, and engineers ride through the pine forests and over canyons filled with forty or fifty feet of snow. Freight of all kinds moves even in the worst weather, keeping vital contact with the outside and permitting mining operations to continue through the winter. Often Tex is summoned to rescue marooned motorists, and it is not uncommon in the Mammoth Lakes region to see his dog team pulling an automobile over the snow-covered highway.

Tex's biggest thrills come when an emergency call sends him rushing on an errand of mercy. Not long ago, one of the men at a mine deep in the mountains used kerosene to light his kitchen fire. Flames leaped to his oil-spattered clothing, and in an instant he was a human torch.

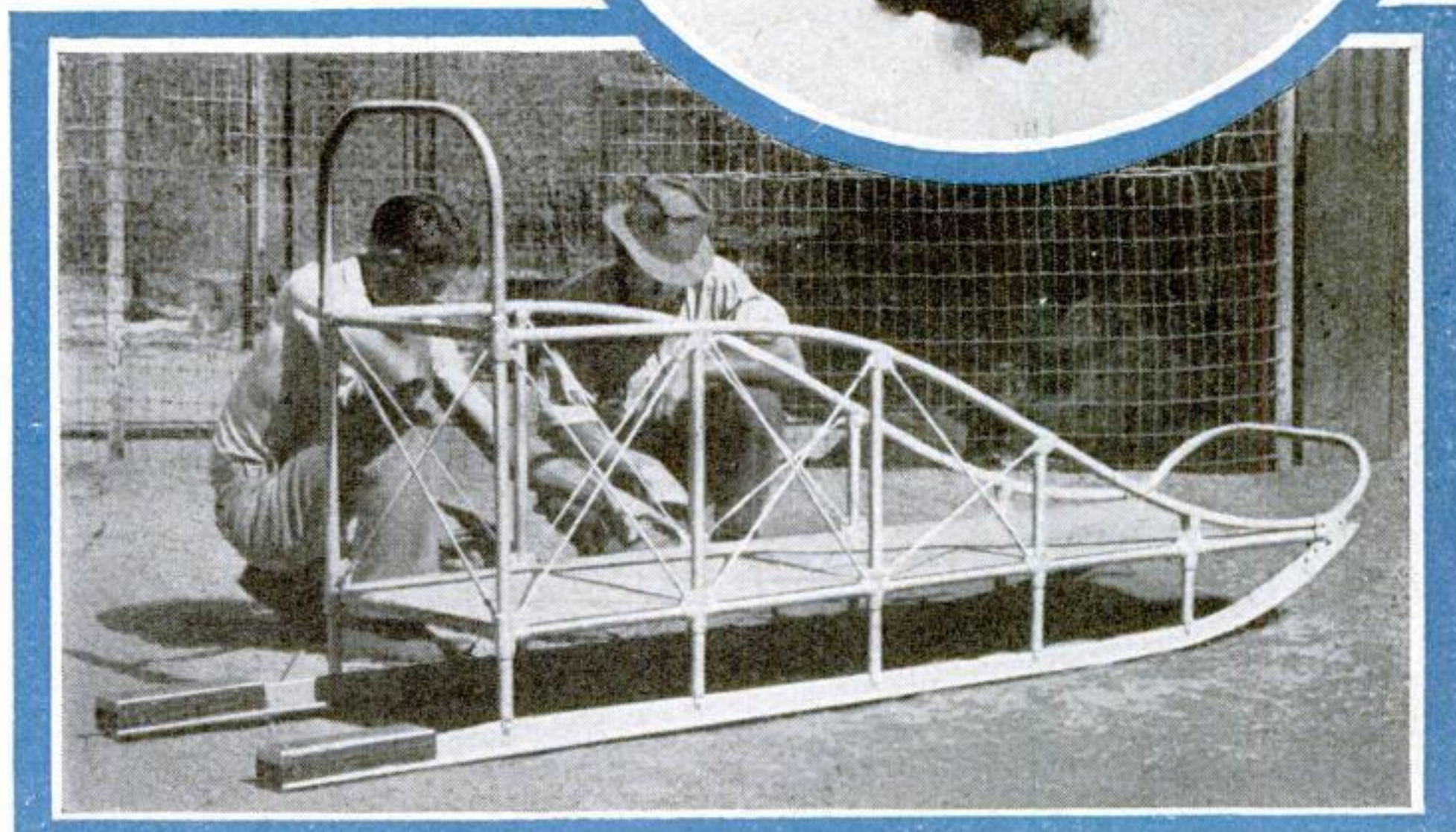
There was no doctor in camp. Using a small radio outfit, the owners of the mine communicated with Los Angeles, 500 miles away, and long-distance telephone shuttled the call to Mammoth Lakes. Within half an hour, Tex was on the trail. For twelve miles, he and seven great-hearted dogs struggled up the steep mountain slopes through soft, wet snow. At length they reached a river, high and swollen by spring freshets, the ice rotten and rapidly breaking up. Carefully they picked their way across the floes and had almost reached the other side when the ice broke

through. By good fortune, the rushing torrent washed them toward the shore, where Tex, grasping an overhanging bush, succeeded in scrambling up the bank. With the help of the lead dog, he was able to drag the rest of the outfit ashore.

Hastily Tex removed his wet outer clothing and, standing almost naked in the cold snow and biting wind, cared first for his dogs' feet. To let ice freeze between the toes meant lame, if not permanently crippled animals. Then he pulled on his now frozen clothing, and together, he and his plucky team struggled onward, finally reaching the cabin after covering twenty miles of steep, difficult trail in *(Continued on page 133)*

THEY LIKE THEIR JOB

Dogs harnessed two abreast for pulling a heavily loaded sled. At the right, a pause for rest at one of the stations used in patrolling Government property



Tex designed this lightweight sled, which was built entirely of an aluminum alloy by an airplane manufacturing company. It is much stronger and lighter than the old type made of wood

. New Freezing Process

KEEPS FOOD FRESH FOR TWO YEARS..

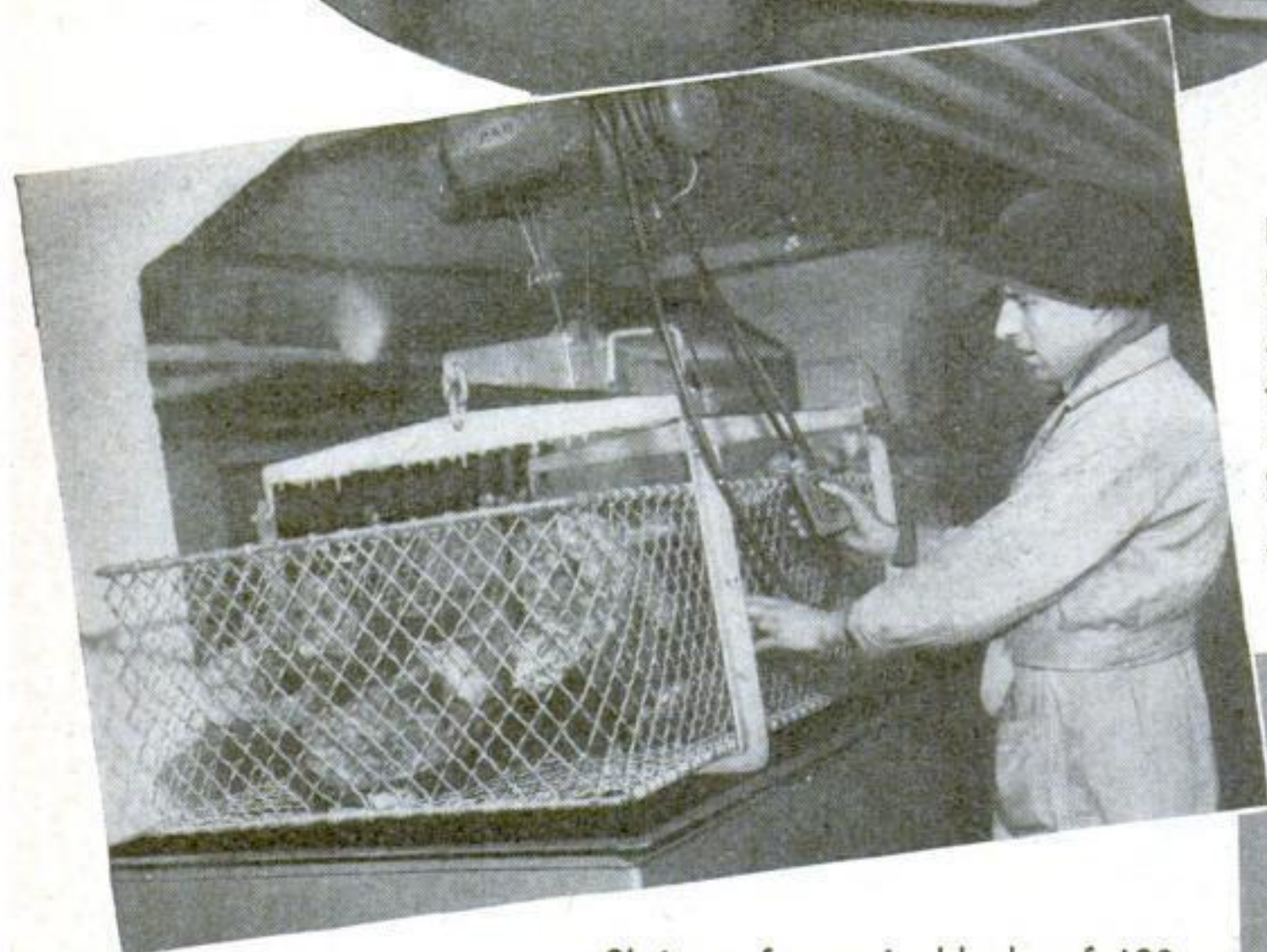
All of the fresh vegetables and fruits pictured in the photograph below have been quick-frozen to keep them for future use



FRESH foods frozen in forty minutes—preserved more than two years! That's the newest development in the quick-freezing method whereby a hundred varieties of fruits, vegetables, and meats are being treated, transported, and delivered fresh at your corner store, not only to taste as they would have when picked, but with their original color and tenderness.

Speed is the watchword in handling frozen foods. In fact, one company maintains portable freezing outfits that can be sped right to the harvest fields.

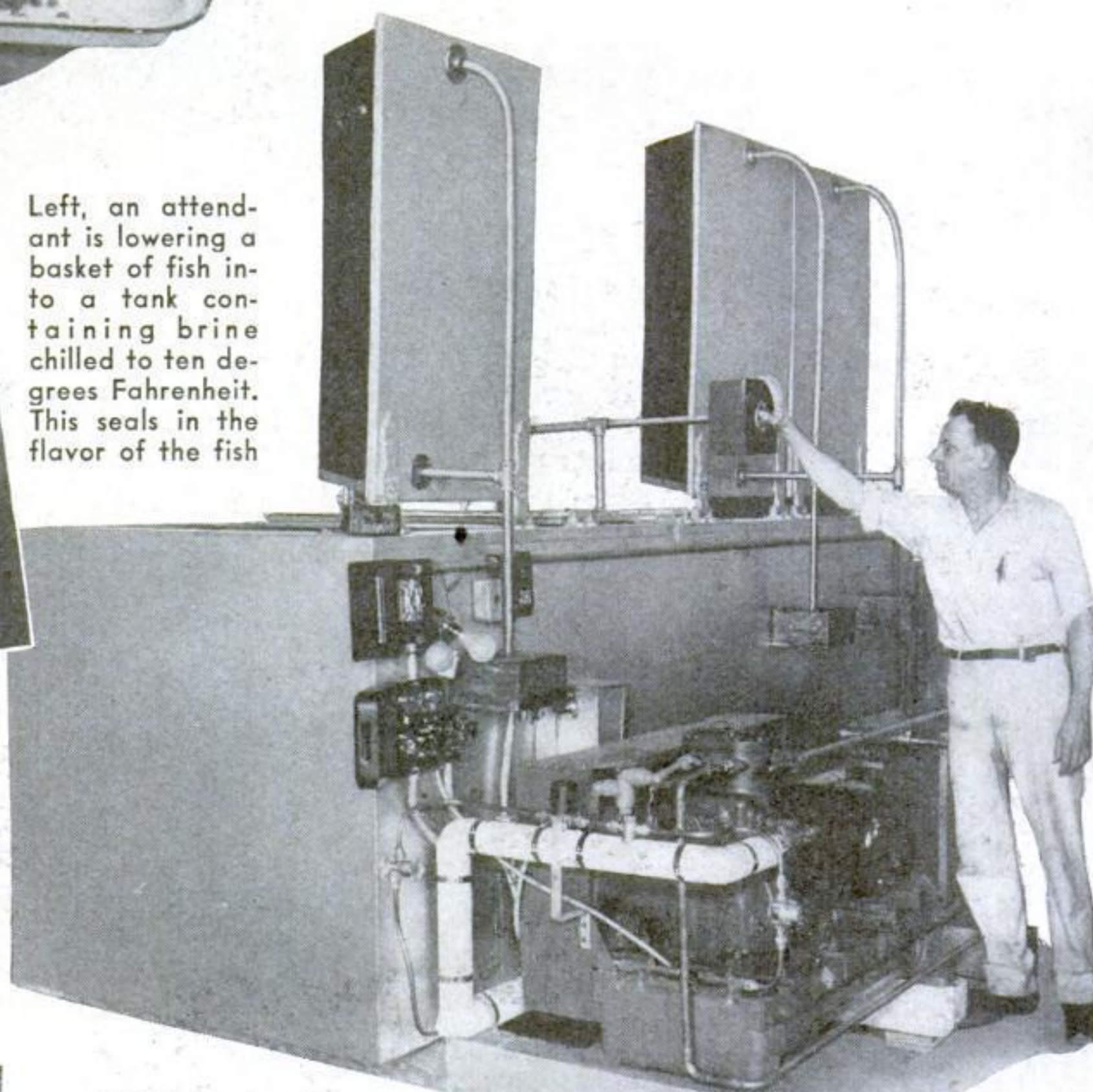
Many foods, such as whole turkeys and sea bass, first are glazed in a near-zero brine solution to seal in their flavor. Some fruits and vegetables are bleached in almost-boiling water to hold their natural color. The food, loose or packed in cartons or cans, is quick-frozen in chambers surrounded by methylene gas, which reduces the temperature eighty degrees in the short space of forty minutes.



Left, an attendant is lowering a basket of fish into a tank containing brine chilled to ten degrees Fahrenheit. This seals in the flavor of the fish



Shrimps frozen in blocks of 120 at Brownsville, Tex., are shown here ready for market in Los Angeles, Calif., after shipment

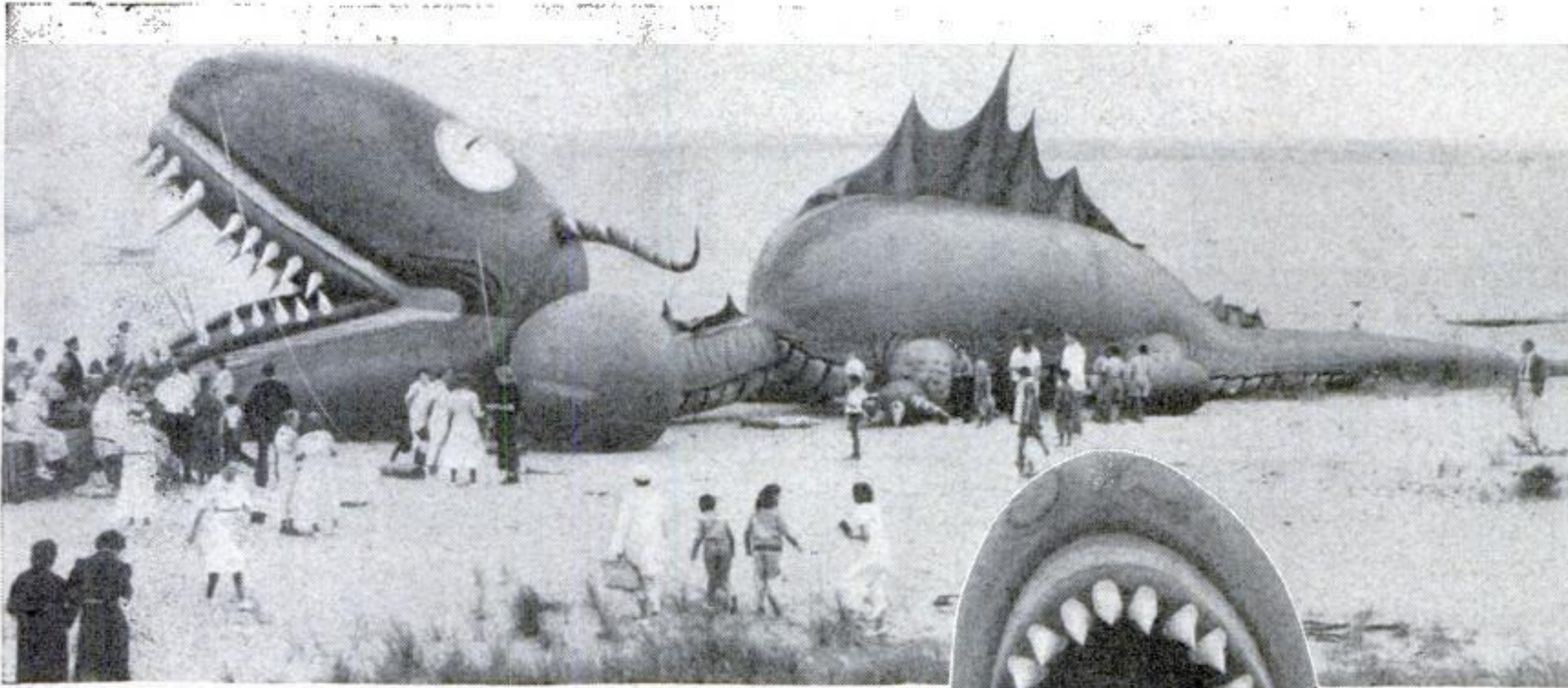


All foods, glazed or not, eventually reach the freezing unit, above, that cools them eighty degrees in forty minutes. The unit uses methylene gas

Quick freezing makes it possible to sell out-of-season foods far from their source. A warm-water turtle is shown at the right, being held by attendant

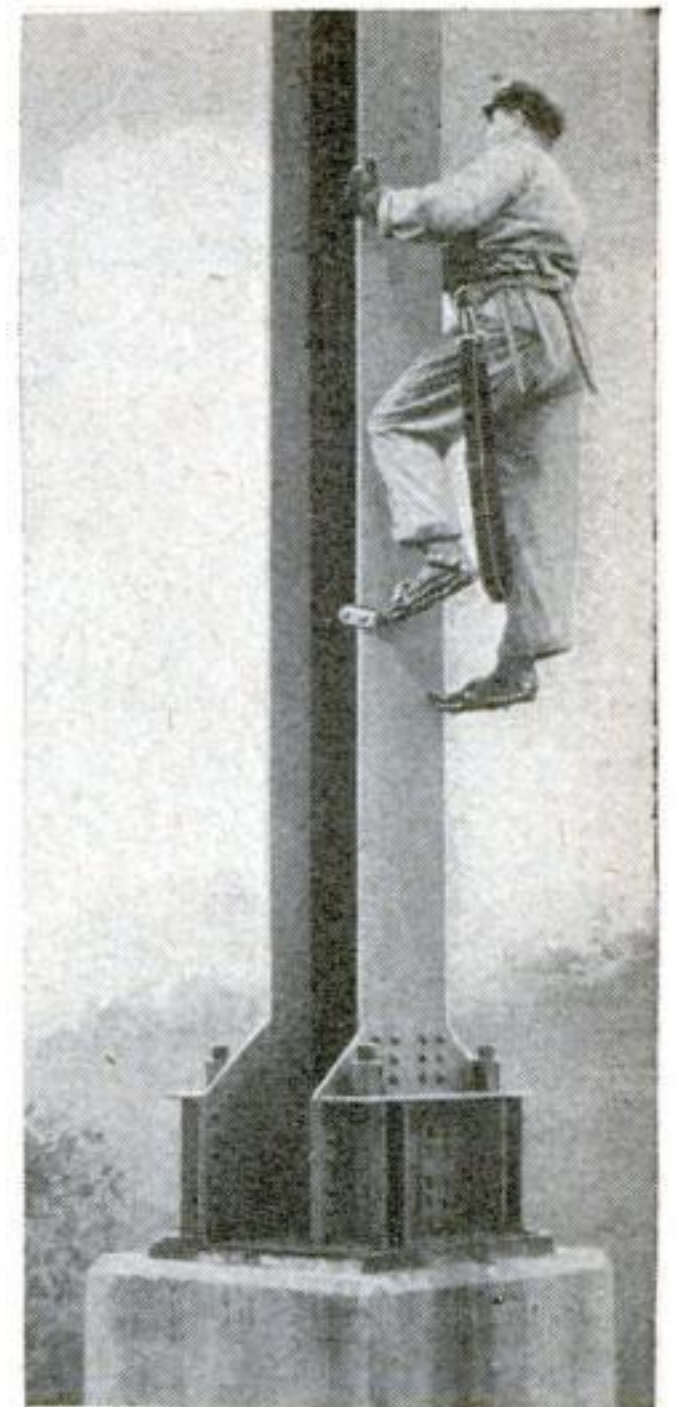
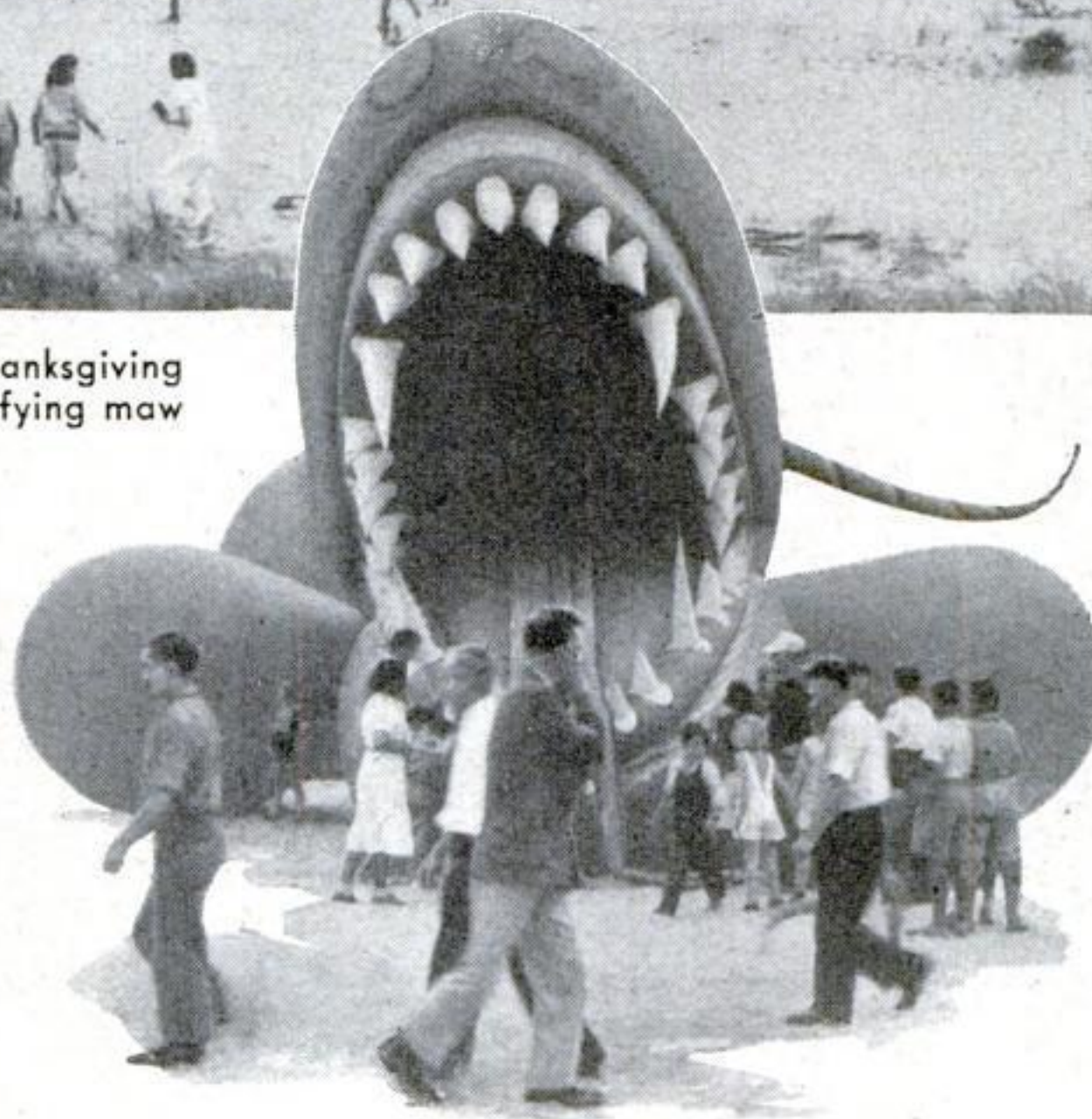


Mammoth Sea Serpent Is Made of Rubber



This air-filled monster will be carried in a Thanksgiving Day parade. At the right is a view of its terrifying maw

MEASURING 135 feet long, the gaping sea monster shown in the photograph above is one of a group of fantastic balloons designed by Tony Sarg, well-known artist and illustrator, for use in a Thanksgiving Day parade in New York City. Three hundred pounds of rubber were required for the Gargantuan serpent. When the monster's designer made the experiment of launching it on water recently, it was necessary to attach a 1,000-pound weight to its bottom to hold it upright.



Steel Workers Get Climbing Spurs

STEEL workers now can mount tall girders quickly and safely with lightweight climbing attachments on their shoes. The units have rollerlike clamps that automatically grasp the girder edge, as shown above.

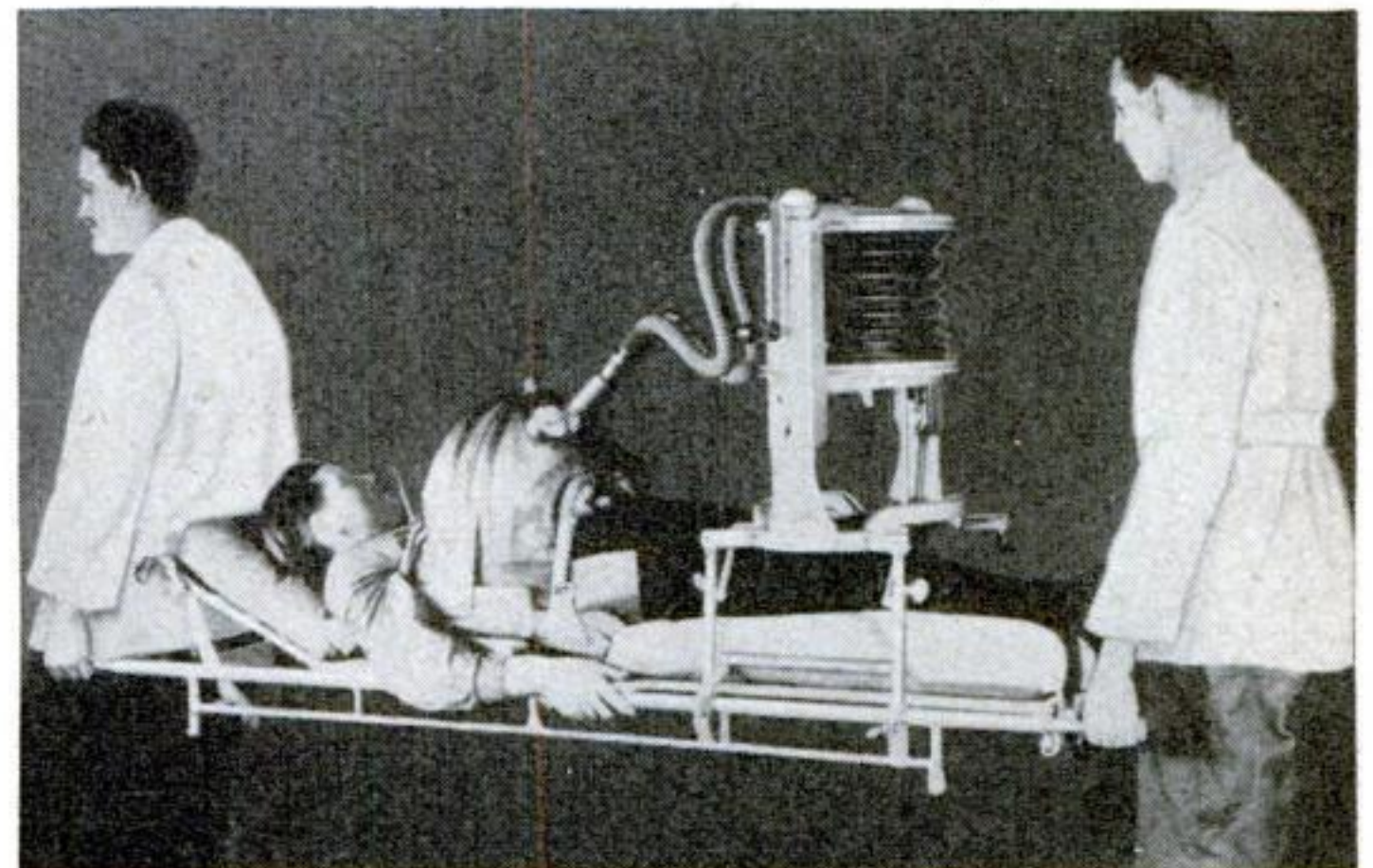


Bomb Shelter Is Built in Abandoned Quarry

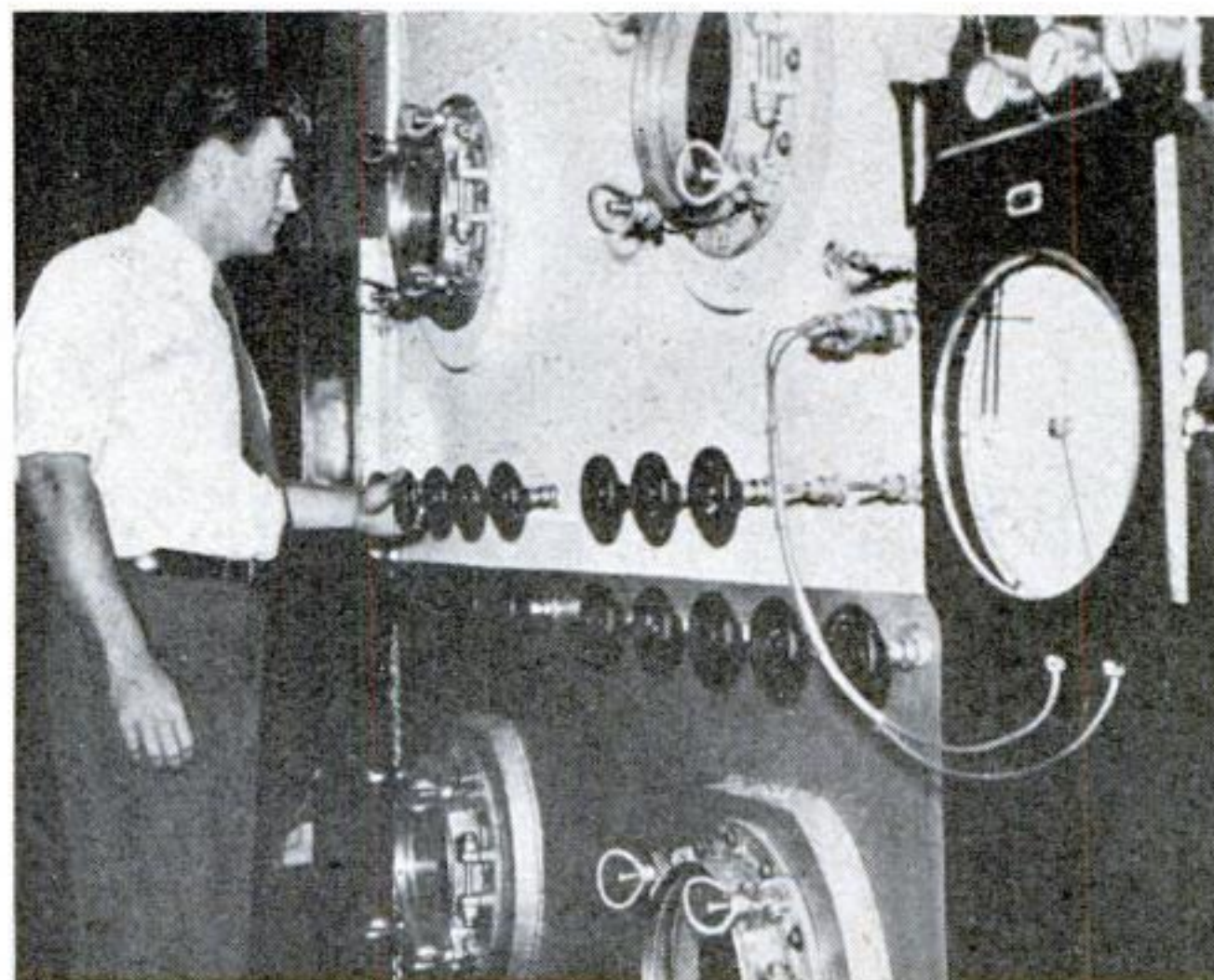
AS A precaution against possible aerial attacks, a bombproof shelter has been constructed in an abandoned quarry far beneath the streets of Paris, France. Reached by a long staircase, with gas-proof doors at top and bottom, the novel hideaway will accommodate 200 persons and is supplied with drinking water and sanitary facilities. The masonry walls are said to be capable of withstanding the explosion of bombs weighing a ton and dropped from planes a mile above the earth. In the photograph above, visitors are sampling the water supply, which comes from a natural well.

Lightweight Iron Lung Fits on Stretcher

COVERING the chest and abdomen, a new type of mechanical respirator leaves the lower part of a patient's body free to move about. Unlike the familiar electrically driven "iron lung" also used for treating patients unable to breathe normally, the new apparatus is operated by hand. Made of aluminum, the device is light enough to be mounted over a patient on a stretcher.



New mechanical respirator that leaves lower part of the body free



Expert watching a set under test inside the sealed chamber

Storm Chamber Tests Radios for Airplanes

RADIO transmitters for aircraft use are tested for their ability to withstand varying conditions in a novel atmosphere chamber. Peering through glass port-holes in steel walls eighteen inches thick, experts check a set's operation in temperatures that may range from forty degrees below to 160 degrees above zero. Artificial storms subject apparatus to simulated high winds and sleet.

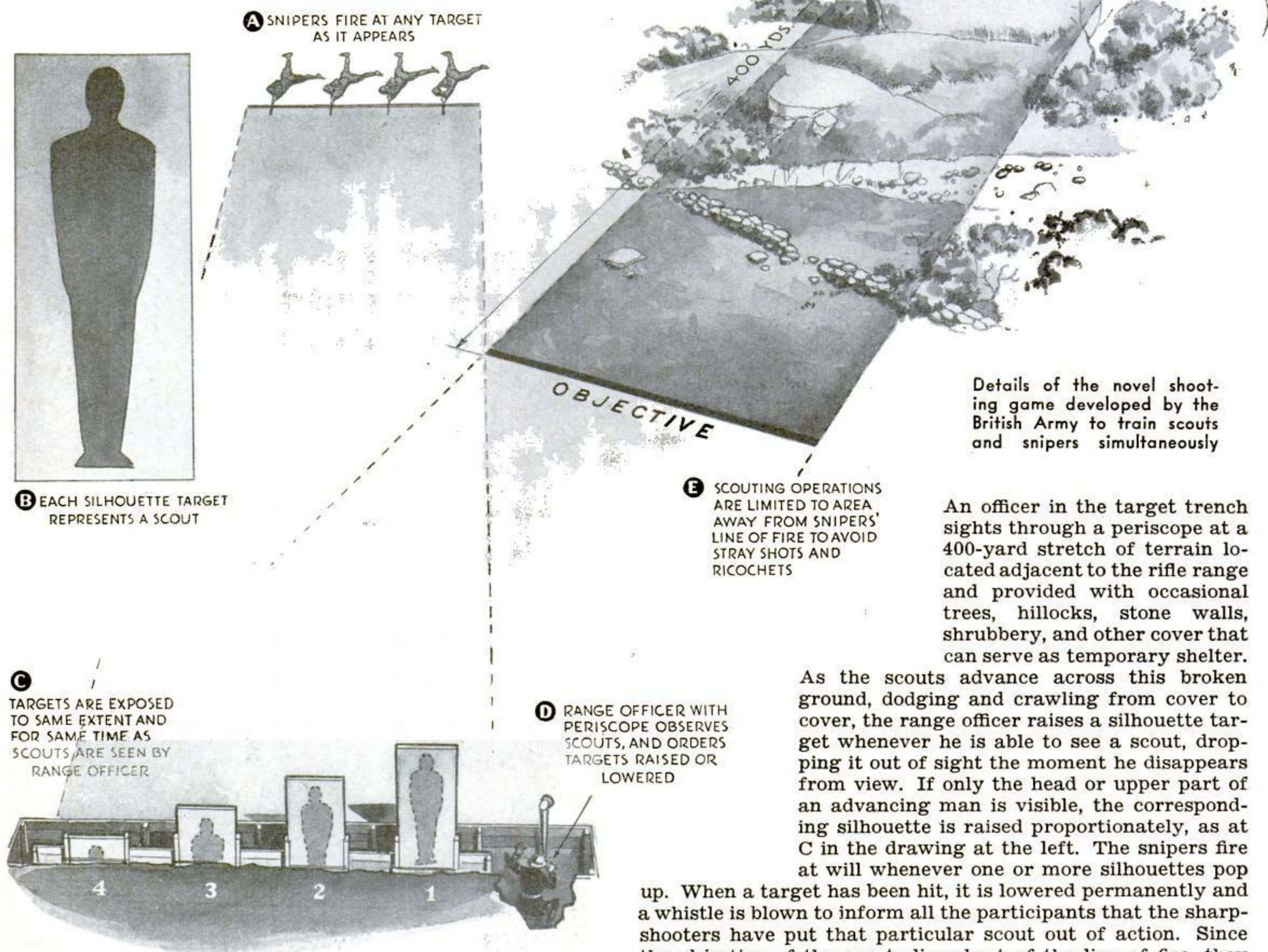
Roadside Restaurant Resembles a Dirigible Balloon



LOCATED upon a main highway in Massachusetts, an odd roadside restaurant has a second story built in the shape of a dirigible balloon. The snub

nose, longitudinal lines, and rear stabilizing fins of the conventional airship are all represented in the unique eating place, as seen in the picture above.

Target Game Trains Both Snipers and Scouts



Details of the novel shooting game developed by the British Army to train scouts and snipers simultaneously

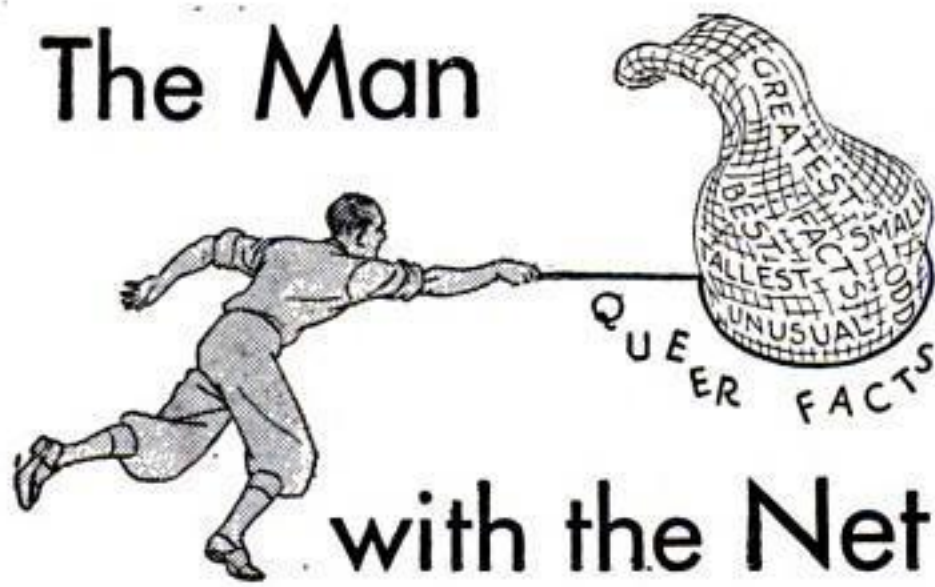
An officer in the target trench sights through a periscope at a 400-yard stretch of terrain located adjacent to the rifle range and provided with occasional trees, hillocks, stone walls, shrubbery, and other cover that can serve as temporary shelter.

As the scouts advance across this broken ground, dodging and crawling from cover to cover, the range officer raises a silhouette target whenever he is able to see a scout, dropping it out of sight the moment he disappears from view. If only the head or upper part of an advancing man is visible, the corresponding silhouette is raised proportionately, as at C in the drawing at the left. The snipers fire at will whenever one or more silhouettes pop

up. When a target has been hit, it is lowered permanently and a whistle is blown to inform all the participants that the sharpshooters have put that particular scout out of action. Since the objective of the scouts lies short of the line of fire, they are in no danger at any time, while receiving valuable, realistic practice in crossing exposed ground. Similarly, the sharpshooters learn to aim and fire their rifles under conditions closely resembling those of actual combat.

SCOUTS advance "under fire" in a new and ingenious training maneuver developed by the Musketry School of the British Army. Sharpshooters at one end of a rifle range aim at silhouettes that can be raised or lowered from target pits.

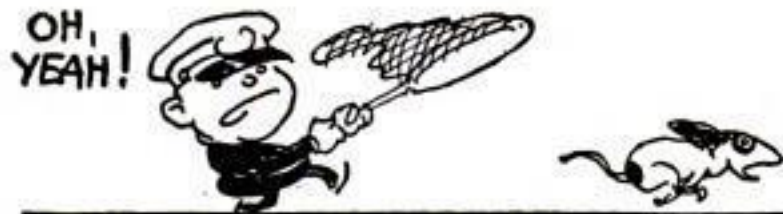
The Man



with the Net

MOTION-PICTURE theaters in the United States can seat 10,000,000 persons at the same time.

AMERICANS CONSUME 80,000 miles of "hot dogs" in a year.



WASHINGTON'S U. S. Supreme Court building is said to contain more marble than any other building in the world.

DIAL TELEPHONES were invented by a business man who thought a rival was seeking to ruin him by having central report his line "busy" when customers called.

RHODE ISLAND'S area is only three times that of Los Angeles, Calif.

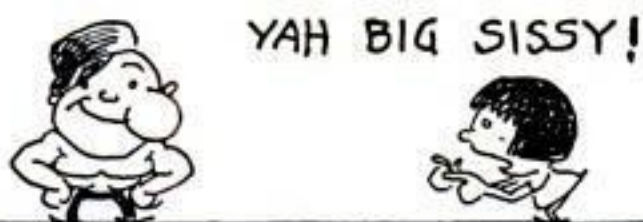


MEDICAL SCIENCE contributes pneumonoultramicroscopicsilicovolcaniosis as probably the longest word found in the English language.

DUCK HAWKS can attain a speed of 180 miles an hour.

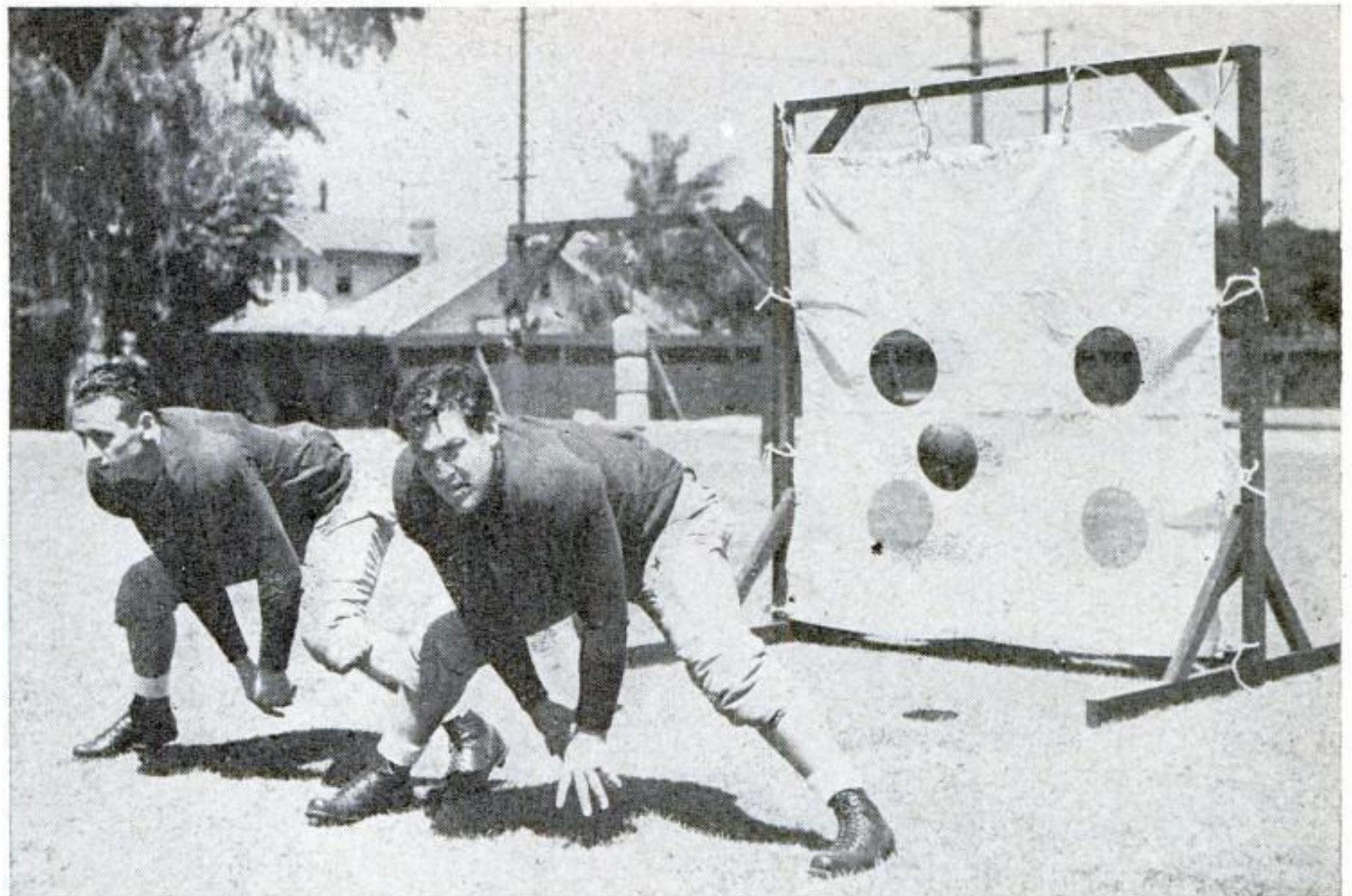
AVERAGE boys have three nicknames.

STEEL-MILL workers are given gumdrops and salt tablets during hot weather to maintain their energy and enable them to stand the heat.



PERFECT-CLIMATE cruises, arranged by steamship lines, carry passengers around the world on an itinerary which brings them to each country when its climate is at its best.

POISON is being injected into the sap of living trees to kill destructive bark beetles.



Football Centers Practice with Odd Target

CENTERS on the University of Southern California football team improve the accuracy of their passes to the back-field with the aid of an odd canvas tar-

get. The players practice by trying to throw the ball through holes in the canvas sheet, as shown in the picture above.

Paralysis Preventive Is Tested on Monkeys

MONKEYS were used to make the first tests of a chemical spray that later was employed as a preventive measure in treating children during the recent epidemic of infantile paralysis. Dr. Louis Gebhardt of Palo Alto, Calif., is shown spraying the solution into the nostrils of a monkey. The treatment requires a doctor's skill, and is believed to prevent entrance of the disease virus.



Spraying a monkey's nose with a new chemical to halt paralysis

Crushproof Velvet

VELVET is now made crush-proof by a special chemical process just devised. Velvet fabrics so treated have retained their shape, it is said, even when crushed for hours under weights equal to that of a heavy person sitting on them.

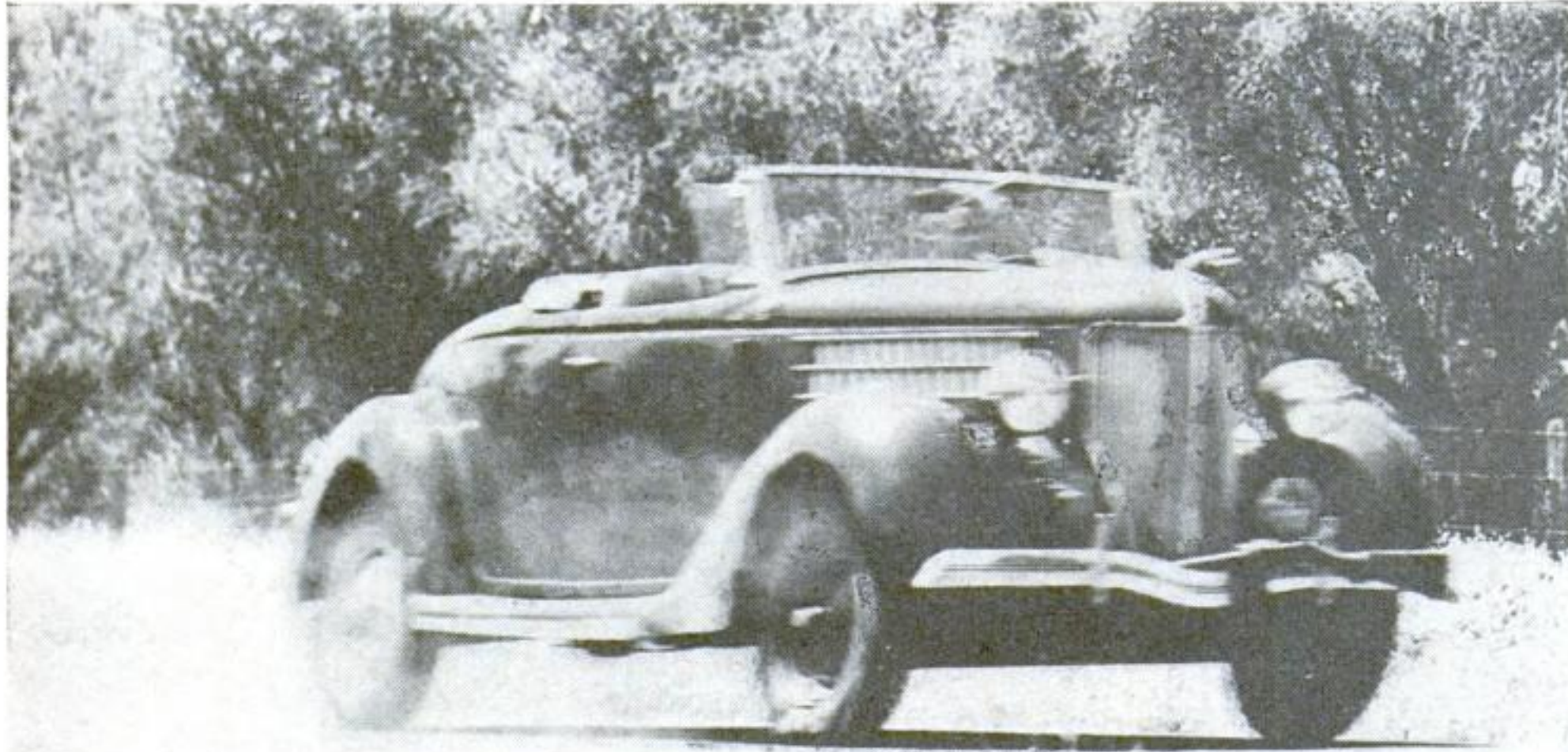


A swivel mount permits announcers to aim this microphone like a gun

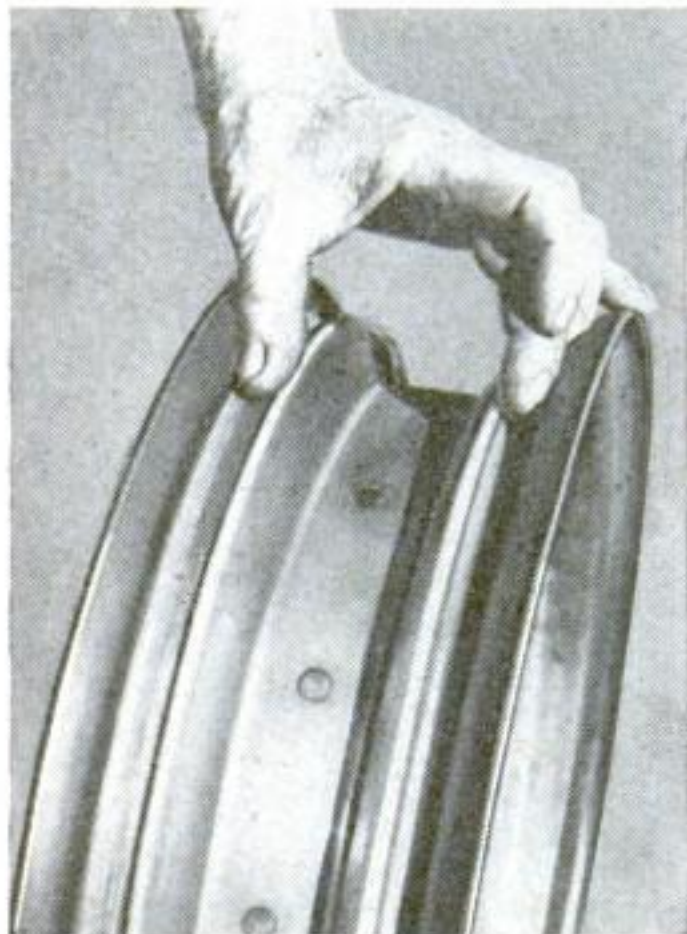
Microphone Resembles a Machine Gun

MOUNTED on a universal joint at the top of a tripod, an odd microphone now undergoing experimental tests resembles a machine gun. Designed by broadcasting engineers especially for outdoor use, the unit picks up a maximum of sound from the direction in which it is aimed, and cuts down much extraneous noise originating from other angles.

Safety Wheel Rim Holds Tire in Place after Blowout



Although shredded by a fast run when deflated, the tire below stayed on its rim



Flanges at left gripped the tire, even after a shotgun had blown the shoe in road test above

PREVENTING accidents caused by cars swerving after a tire blowout, an automobile wheel rim devised by a California inventor grips a tire securely and prevents it from coming off if a blowout occurs. Small metal flanges on the wheel shoulder grip the beads on the tire edge, making shoe and wheel practically one unit, and preventing the terrific vibration and loss of steering control when a tire suddenly deflates at high speed. In a dramatic exhibition of the invention, a shotgun fastened to a car bumper

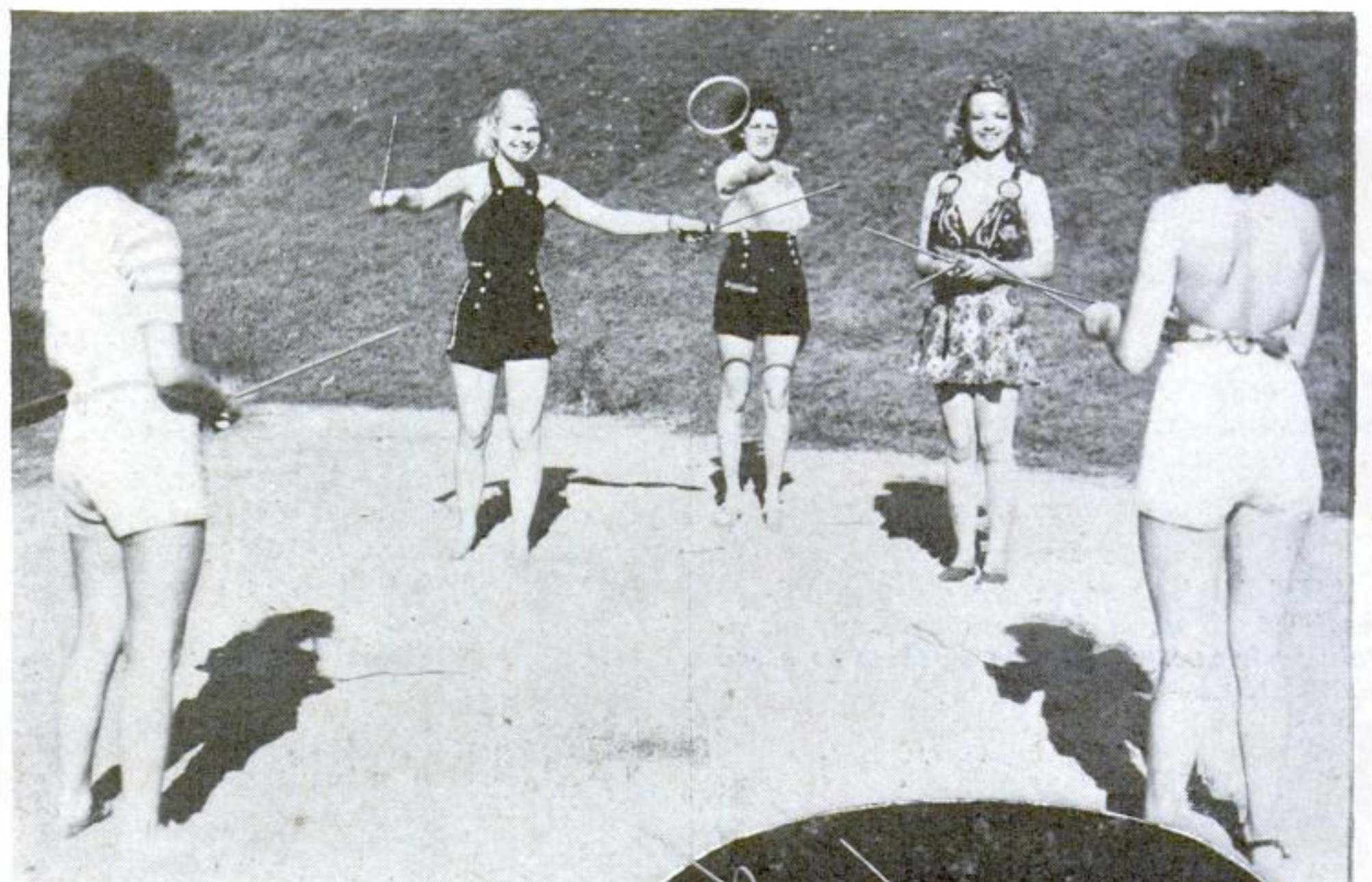
tore a fist-size hole in a front tire while the automobile was racing at high speed. The gun was discharged by means of a cord attached to the trigger and leading to the driver's seat.

Novel Electric Stove Is Heated by Bulb

ENCASED in a funnel-shaped container of copper, aluminum, and sheet iron, a 300-watt electric light bulb provides heat for cooking the meals of a Seattle, Wash., inventor. Set into a floor standard, the metal focuses the heat from the bulb onto a cooking grill. In cold weather, the contrivance also may be used to take the chill off a poorly heated room, the inventor claims.



A 300-watt electric light bulb mounted in a special housing provides heat for cooking



Loop-Tennis Game Played With Wands

LOOP TENNIS is an odd new sport that has recently gained popularity among Hollywood movie stars. A light wooden hoop is slipped over two long wands shaped like swords, one held in each hand. When the wands are whipped apart as shown in the photograph above, the hoop slides off and hurtles through the air. It must then be caught on the wand of an opponent.



Players use light wooden wands to flick the small hoops to each other in this unique outdoor game

Could You Be a MOVIE STAR?

...ODD CAMERA TEST FINDS NEW FACES FOR HOLLYWOOD

DISCOVERING potential screen stars in the horde of applicants that pours into the movie capital each year is the purpose of an odd photographic laboratory directed by Bob Mack and Sara Parsons, Hollywood photographers. After a preliminary psychological test, the aspirant to screen fame is photographed against a black backdrop while covered so that only the face is visible. The resulting "facial map" is enlarged for use in devising the correct make-up and the method of lighting that will accentuate the best features. The subject then acts out a series of pantomimes while alone in a room decorated on one wall with what appears to be a row of four mirrors. One of these, however, hides the lens of a motion-picture camera in an adjacent room. In this way, natural actions are assured, since the potential star is completely unconscious of any audience or even of a camera lens.

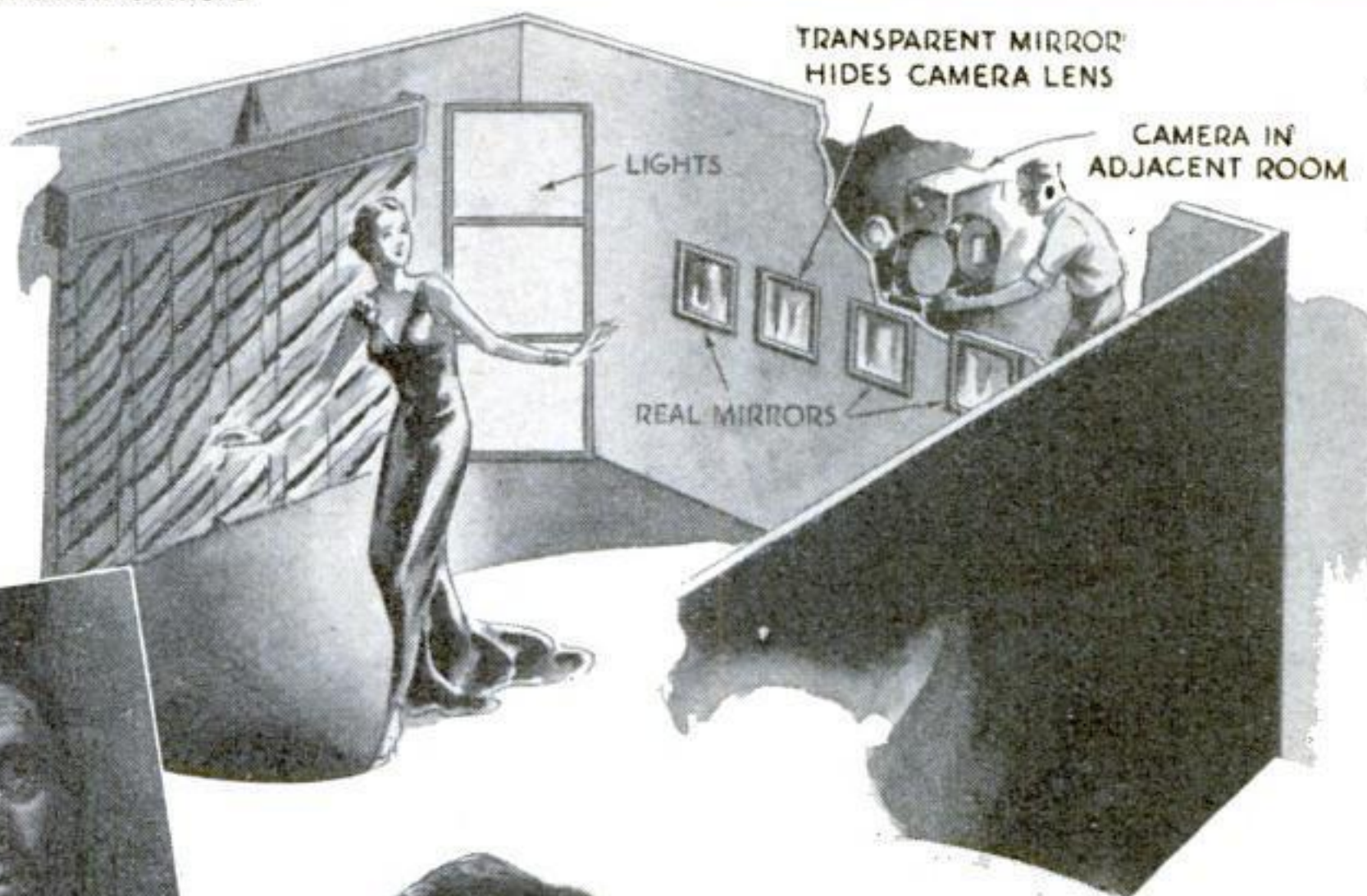


GETTING READY FOR THE TEST

Bob Mack preparing a movie applicant before photographing her for a "facial map." Below, the aspirant is acting out a pantomime in front of a hidden camera



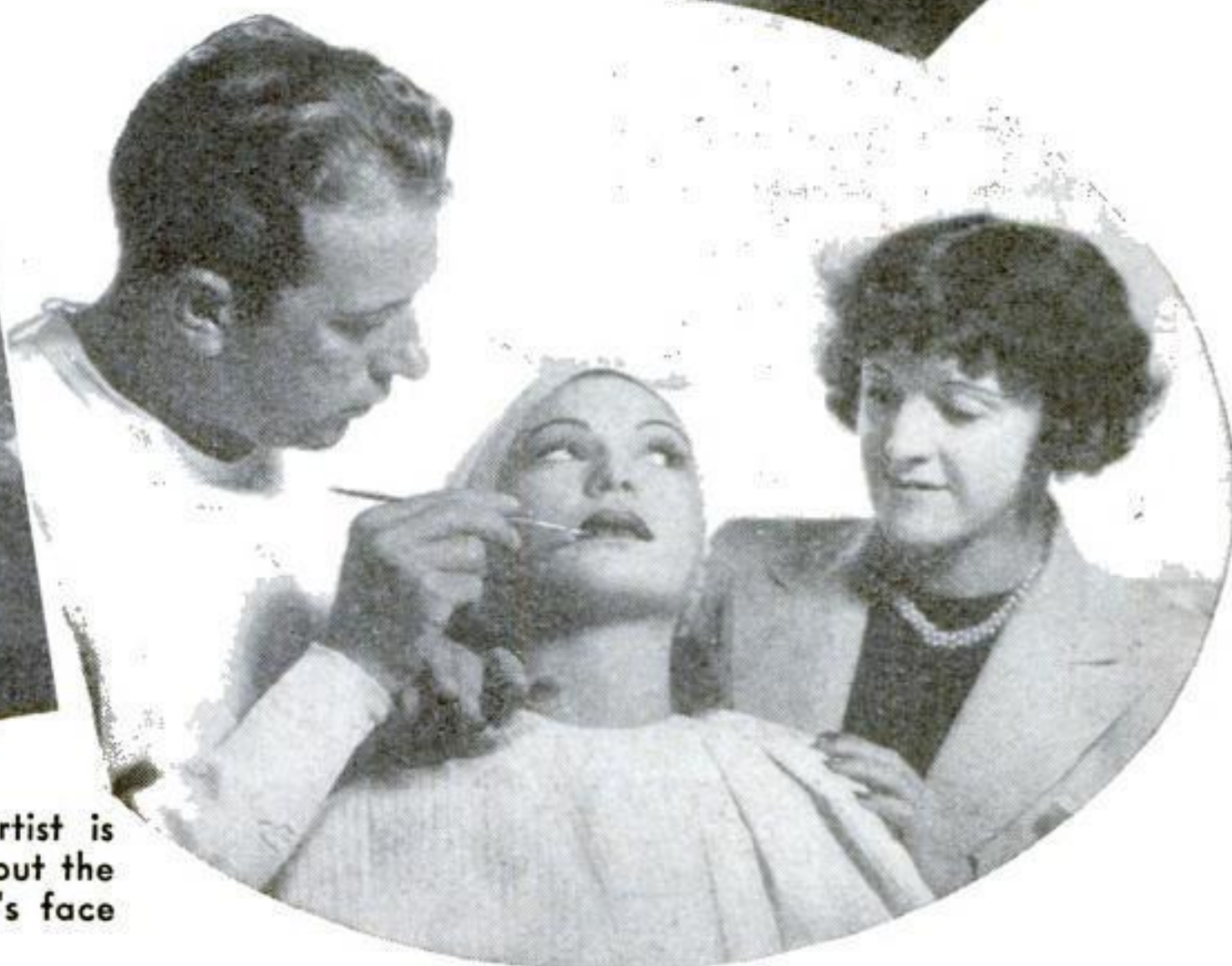
With his partner, Sara Parsons, Mack studies an enlarged picture of the living mask to determine what make-up and lighting the face needs



Hidden behind one of the mirrors on the wall of the studio, a motion-picture camera catches the budding star in natural action



At the right, a make-up artist is applying cosmetics to bring out the best features of the subject's face



Mysterious Crimes Solved



Three two-cent stamps found in the pocket of a hit-and-run victim led to his identification. Left, Frank Del Witt with a projector he uses to study stamps for peculiarities



**The strange hobby of a collector
suggests an entirely new weapon
for law-enforcement authorities**

By EDWIN TEALE

WITH headlights boring through the darkness, a speeding car whizzed around a curve in Westchester County, N. Y. Too late, the driver saw a pedestrian ahead. There was the screech of rubber on concrete, a thud, and the machine raced away, leaving the victim dead beside the road.

Early next morning, a milkman discovered the body. There were no letters, no cards, no personal papers in the dead man's pockets. The only clues to his identity were a pen-knife, a few coins, and three two-cent stamps. Police carried the stamps to a stamp collector in Yonkers named Frank Del Witt, a sort of amateur Sherlock Holmes of philately.

Del Witt studied them carefully by transmitted light. He magnified them to huge proportions with a projector. He compared them with specimens in a carefully classified file. Then he announced that the stamps had been pur-

chased in one of two zones within the city. Concentrating their inquiry in these areas, the police quickly discovered the identity of the unknown victim.

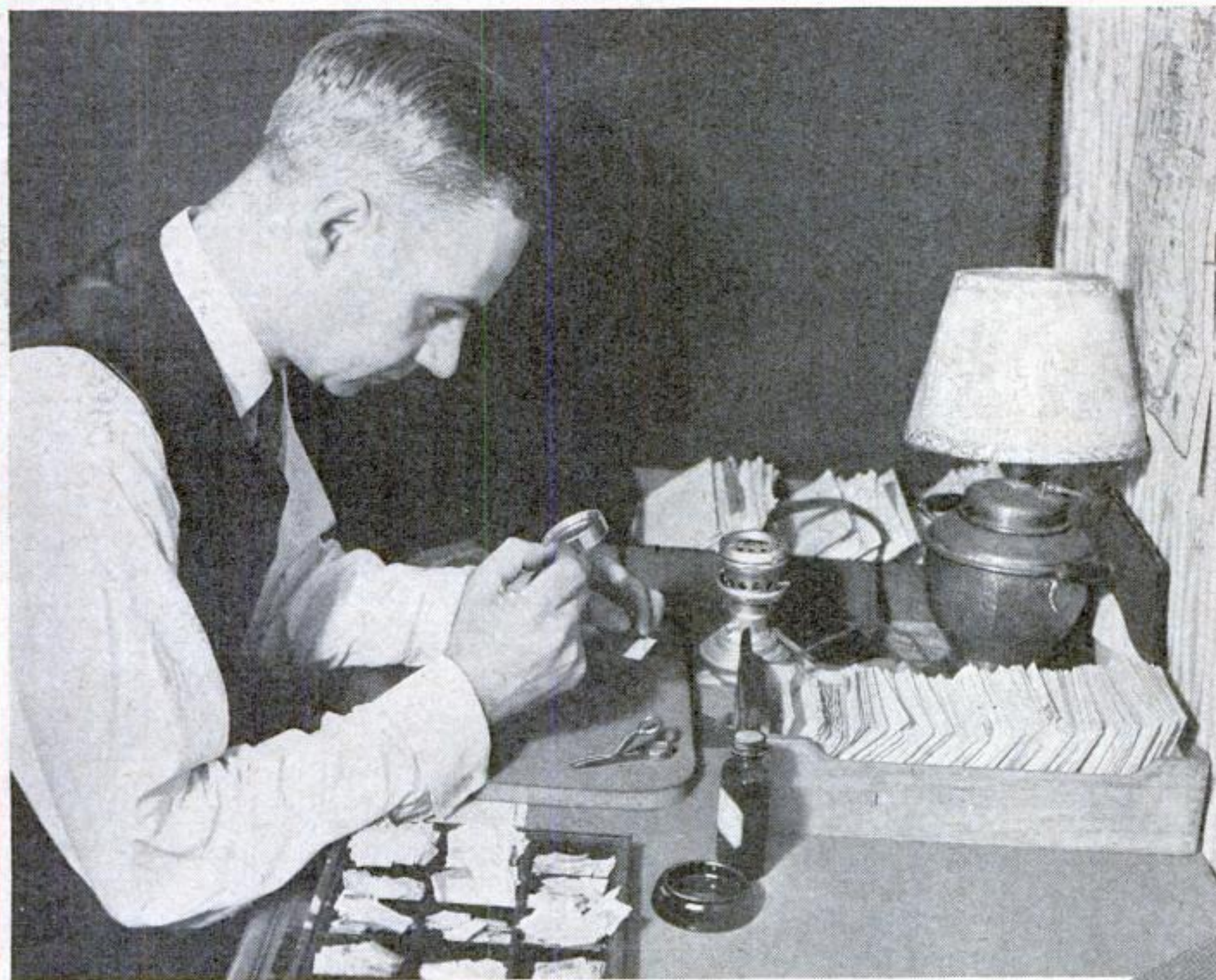
For nearly a decade, Del Witt has been working out a system of "finger-printing" stamps for use in crime detection. His hobby began as a joke ten years ago, when he was employed as assistant to a New York newspaper columnist. One day, the writer handed him an anonymous letter.

"You're a stamp collector," he said. "Tell me where that stamp came from!"

Later, Del Witt began wondering if it really would not be possible to find clues in stamps that would aid in solving such cowardly crimes as kidnapping, blackmail, and extortion. He had established a stamp store in Yonkers, just north of New York City, and here he found a chance to test the idea. Each day, he received batches of used envelopes from local business houses. Before he removed the stamps for sale to collectors, Del Witt began sorting the envelopes, according to the return addresses, to show the different zones from which they came. Then he compared the stamps, seeking clues to their origin.

As his skill increased, he learned to recognize stamps from several vending machines which cut them off in a peculiar way. Then, he found other clues, often microscopic, which set the stamps apart. Minute ridges of gum on the backs identified those which had been printed on a rotary instead of a

by Stamp Detective



Del Witt examining a specimen for clues. Some of his extensive reference files can be seen

flat-bed press. Feathery edges along the perforations distinguished paper made up of unusually short fibers. Watermarks, the number and position of the perforations, the varying shadings of color, and the way stamps are torn apart, all provide clues of importance. Concentrating his efforts in his own neighborhood, he continued his researches year after year.

He purchased stamps from all the stores in a given area and sent himself letters, later comparing the stamps with specimens he had retained to see if he could determine the store from which each came. He used micrometers, magnifying glasses, perforation gauges, and projectors to aid him in the search for clues.

Soon after he began these studies, Del Witt had a chance to tackle a real case. A resident of Yonkers began to receive anonymous threat notes, purportedly written by members of a nationwide gang. Each letter was postmarked from a different city, but Del Witt proved that they all came from one person. As soon as he looked at them, he noted a peculiar thing about the stamps. All had the same irregularity, defective "centering." The perforations along the top cut unusually close to the engraved portion. Not once in 1,000,000,000 times would a group of people buying in different cities all get stamps with the same peculiarity.

In another instance, the stamp detective helped stop a crime before it could be committed. Among the letters

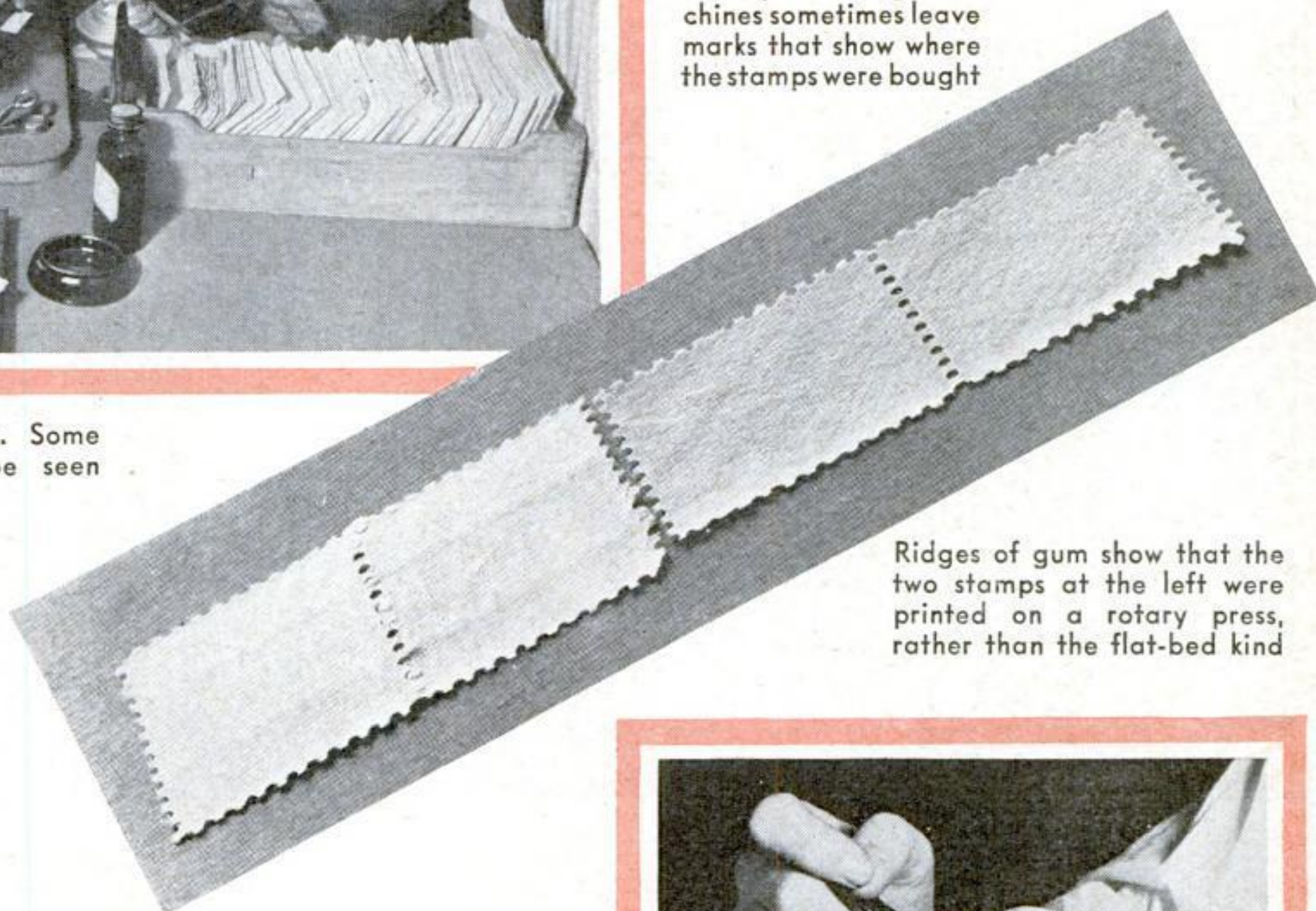
received at the Yonkers police headquarters, one morning, was an unsigned note containing the information that some unnamed woman was threatening to stab another woman for alleged attentions to her husband. It provided no help to the officers until Del Witt examined the stamp. Markings left by a vending machine tallied with those on one of the stamps in his large collection. With this clue, detectives set to work. They hurried to the section of the city where the machine was located. By making careful inquiries at stores and bars they soon learned who in the neighborhood was having family trouble, and were able to head off a possible murder.

At present, vending machines provide the greatest aid to the stamp detective. Just as no two file strokes leave marks that are identical when viewed under a microscope, so no two dispensing mechan-

(Continued on page 147)



Stamp-vending machines sometimes leave marks that show where the stamps were bought



Ridges of gum show that the two stamps at the left were printed on a rotary press, rather than the flat-bed kind



This original piece of apparatus enables Del Witt to examine specimens by light transmitted through the paper from beneath. This reveals many clues

Scientific Mink Ranch Breeds Giant Fur-Bearers



At left, a mink eating his scientifically prepared food at the Woodstock, N.Y., breeding farm

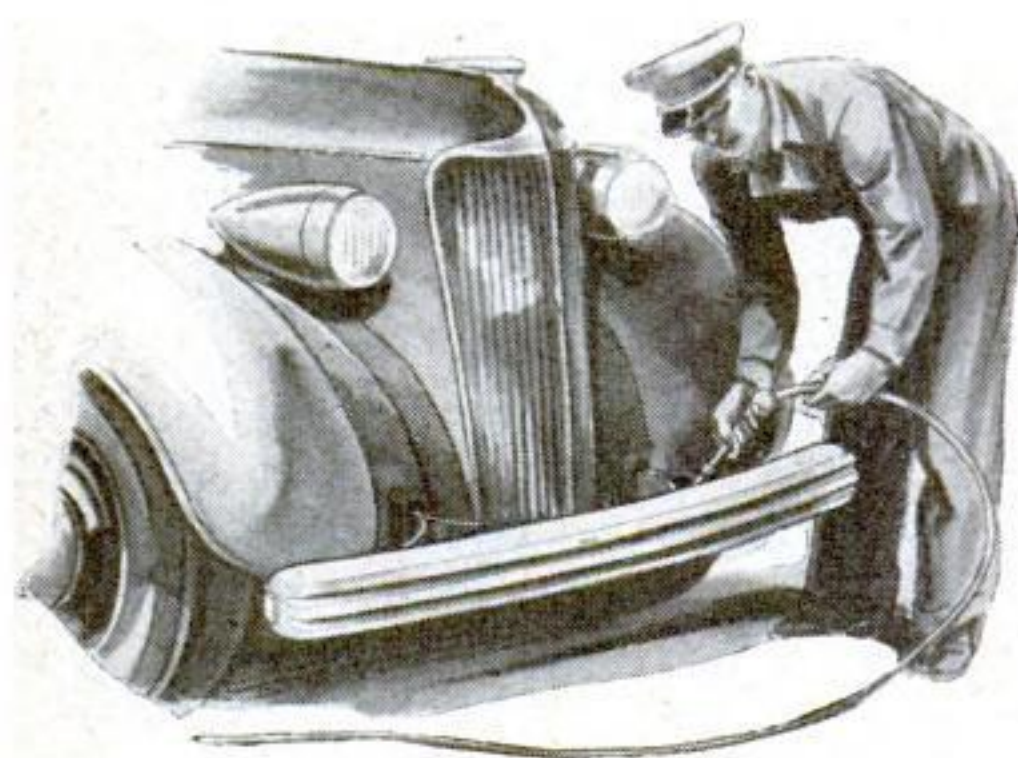
The busy scene pictured below is in the kitchen of the ranch, where 757 pounds of well-balanced mink food is prepared and mixed daily



One of the tiny animals being given a hypodermic injection to prevent disease

BREEDING a race of giant mink that will yield furs as valuable as those from animals trapped in Labrador or the Yukon, is the achievement of a scientific mink ranch at Woodstock, N. Y. Using the latest advances in nutrition, genetics, pathology, and biochemistry, the ranch owners nurse their charges with as much care and attention as a doctor gives a newborn infant. To insure the mink a balanced diet, they are fed a wide variety of healthful foods, including choice cuts of beef, frozen fish, swiss chard, tomatoes, spinach, eggs, and a weekly ration of cow's blood to build up resistance to pneumonia. Experts maintain a constant watch over the health of the valuable little animals, making frequent blood tests and administering hypodermic injections against disease. Since the fur must not be allowed to get brittle, it is tested periodically in a delicate machine that checks the tensile strength of the hair. The animals are registered by number, and mated according to a scientific plan that is designed to bring out the best characteristics of the parent mink in the offspring, thus constantly improving the breed and making the pelts more valuable in the fur market.

uable little animals, making frequent blood tests and administering hypodermic injections against disease. Since the fur must not be allowed to get brittle, it is tested periodically in a delicate machine that checks the tensile strength of the hair. The animals are registered by number, and mated according to a scientific plan that is designed to bring out the best characteristics of the parent mink in the offspring, thus constantly improving the breed and making the pelts more valuable in the fur market.



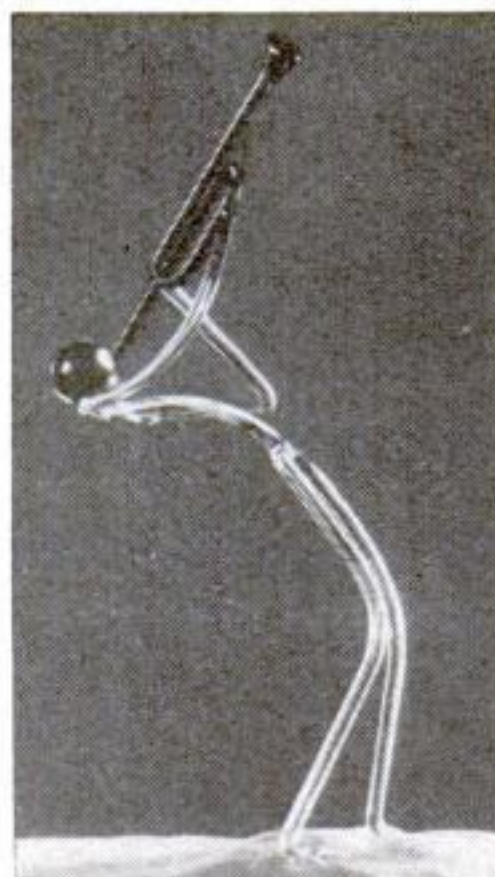
Shockproof Car Bumper Blown Up Like a Tire

RESEMBLING a straightened section of automobile tire, a pneumatic bumper for cars is said to absorb collision shocks and ordinary jars received in traffic. Held to its metal support by flanges like those on a wheel rim, the rubber casing contains an inner tube which can be inflated through a projecting valve to any pressure desired. Brackets connecting the bumper with the chassis of the car are bowed, giving a further cushioning effect in case of severe shock.

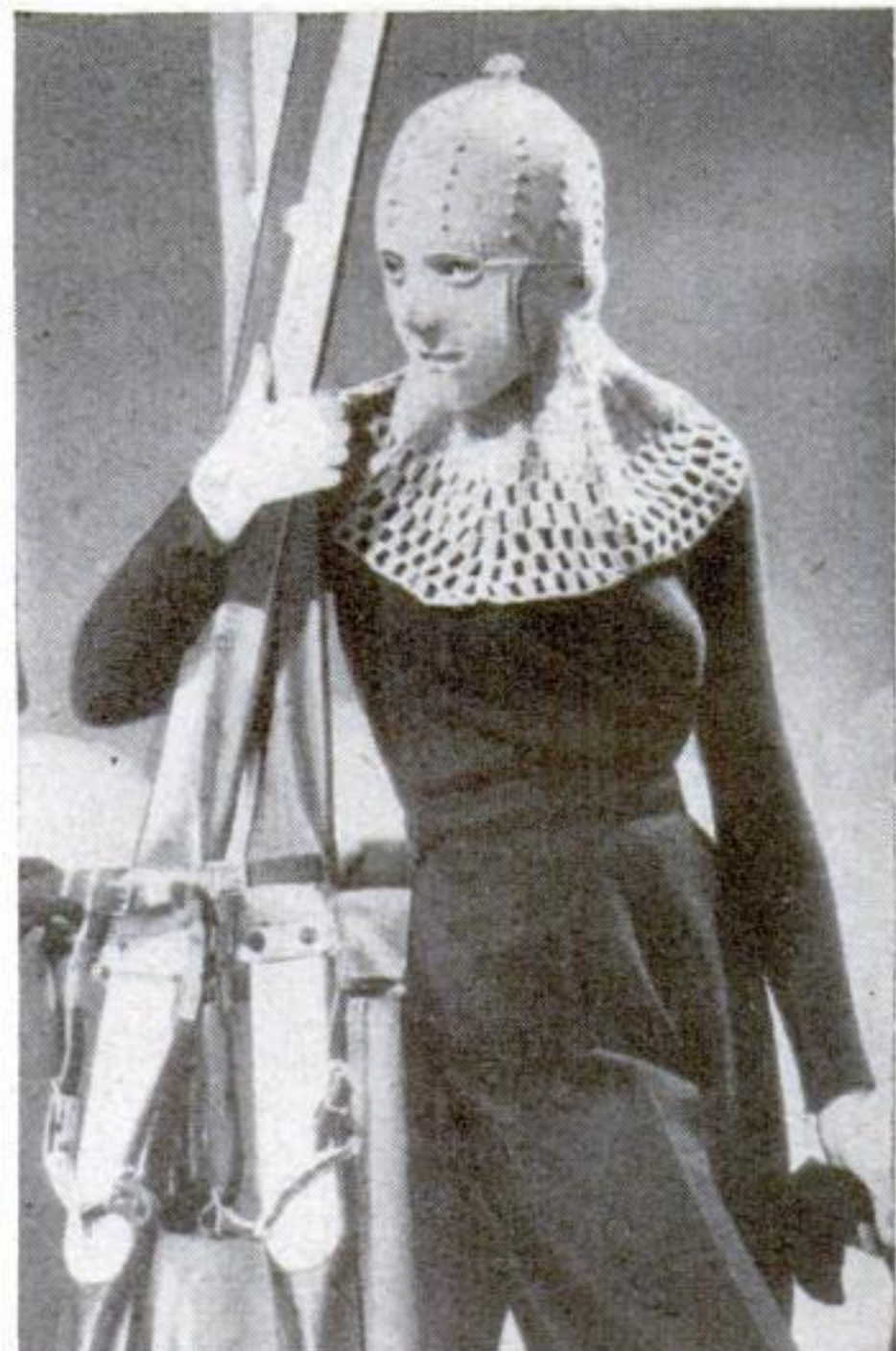
Skiing Helmet Resembles Medieval Armor

AN ODD knitted skiing helmet recently introduced closely resembles the linked-mail casque of a medieval armored knight. The winter headgear has holes for the eyes and mouth, but otherwise covers all parts of the face, head, and neck, as a protection from cold winds and driving snow.

Glass Trombone Player



BLOWN from glass, the odd figure shown in the photograph at the left is one of the members of an all-glass "orchestra" designed by Piet van Gelder, a noted artist of Amsterdam, Holland. The decorative novelty illustrated was fashioned in the shape of a trombone player in a jazz orchestra.

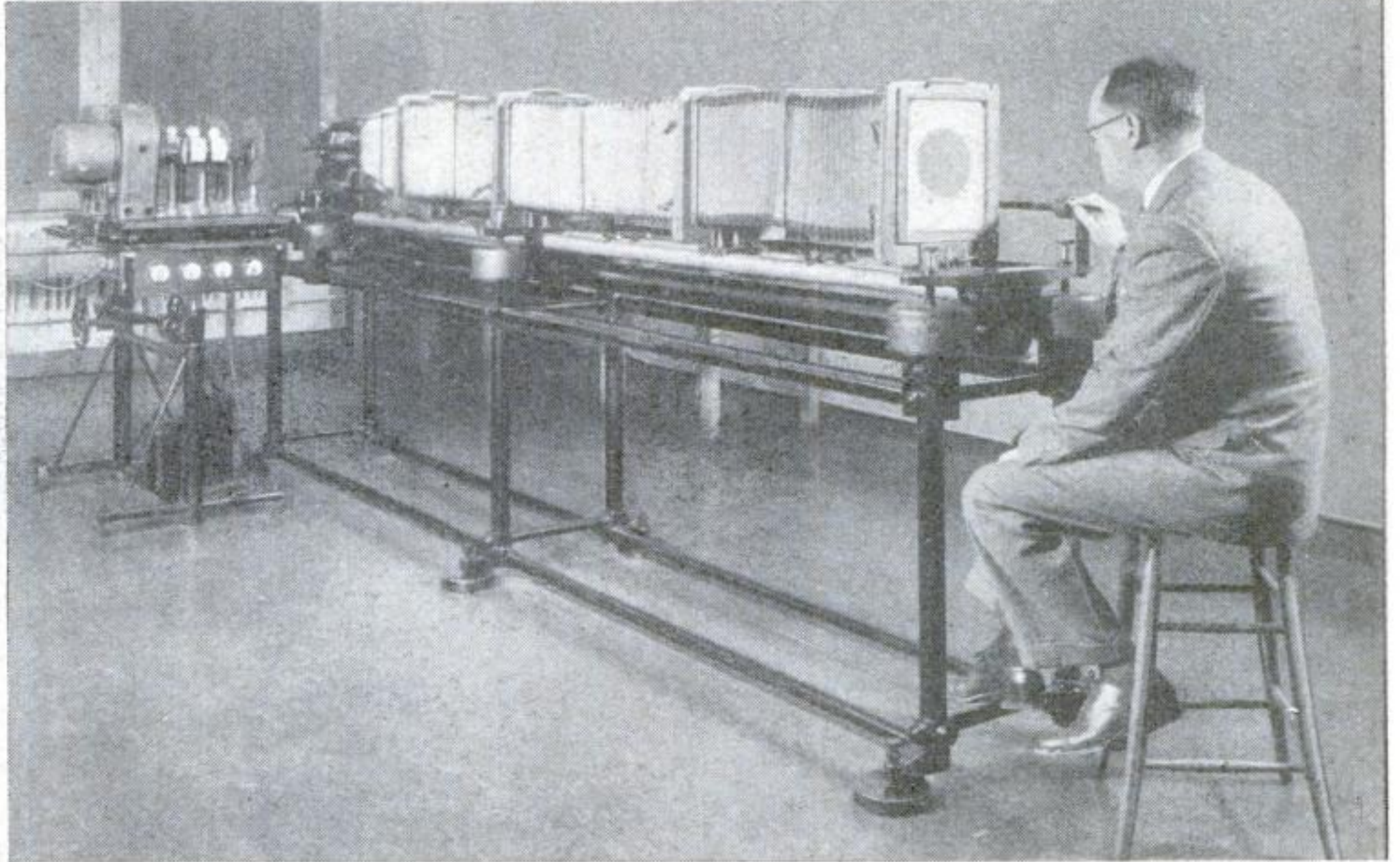


This odd headgear has a covering for the face, leaving only the eyes and the mouth exposed

Microscope Is Twelve Feet Long

MAGNIFYING 7,000 times, an instrument in use at the Bell Telephone Laboratories in New York City is said to be the largest microscope in the world. Completely assembled, the unit

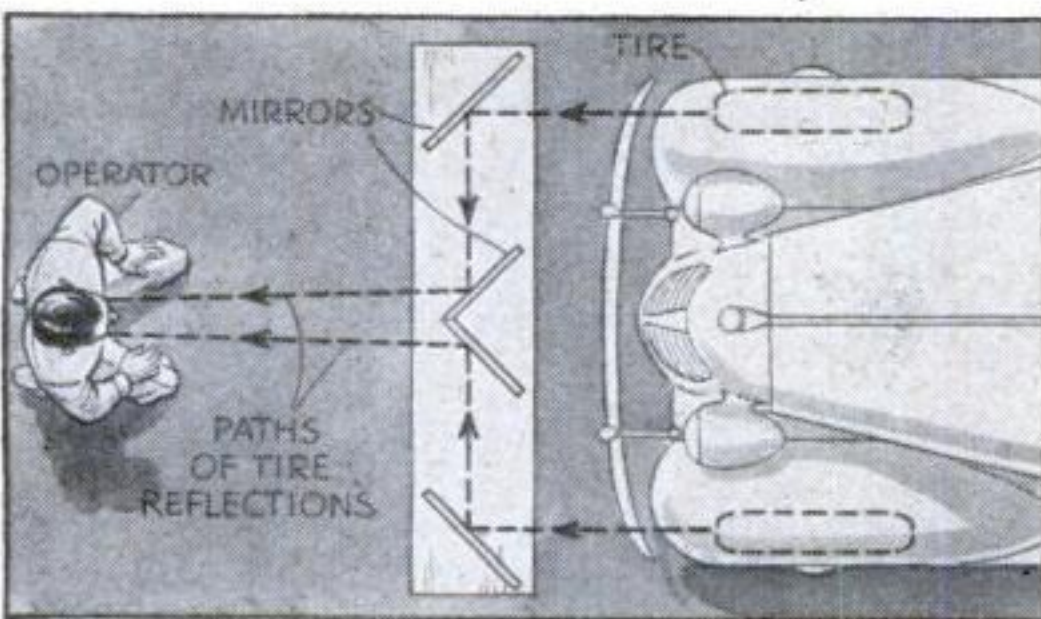
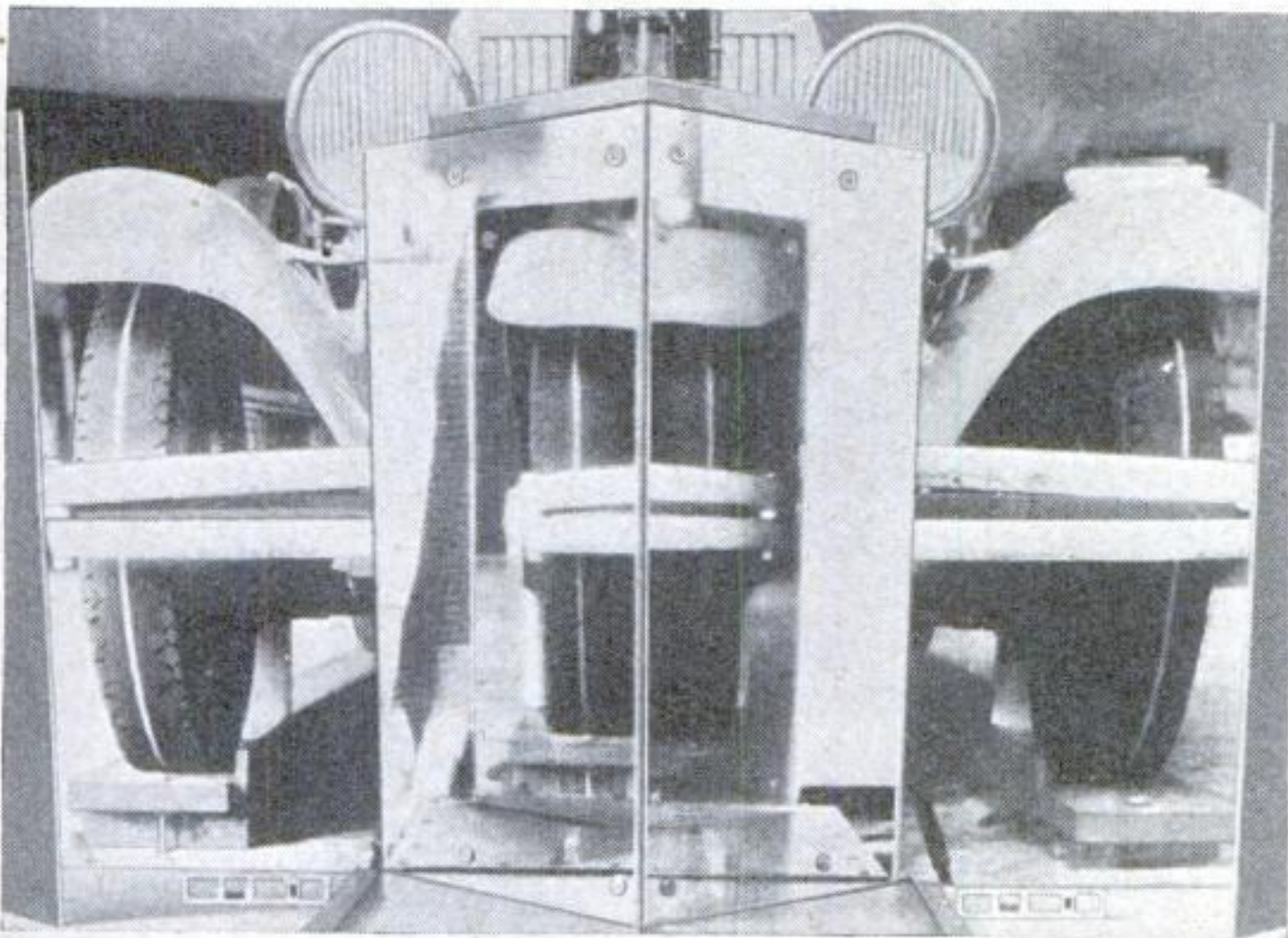
occupies an area twelve feet long and ten feet wide. The giant magnifier is used for photographing the internal structure of metals to determine their suitability for telephone equipment.



Telephone experts use this huge microscope for photographing the internal structure of metals

Pump Works Portable Drinking Fountain

A PORTABLE drinking fountain introduced for field workers on a Hawaiian sugar plantation is operated by compressed air. Pumping a hand lever creates air pressure to force out cool water from an ice-surrounded container when a small valve is opened.



Front wheels of a car as viewed in the alignoscope. Chalk lines show centers of tires

How the mirrors reflect images of tires for side-by-side comparison

Mirrors Check Wheel Alignment

MIRRORS that place reflections of the front tires of an automobile side by side are used to adjust the wheels in a new device called an alignoscope. Glasses set directly in front of the wheels reflect images of the tread into the V-shaped mirror seen in the center of the photograph. By checking the reflections of chalk lines drawn around the center of the tires, mechanics can quickly determine the relative positions of the wheels. By adjusting and setting the mirrors at various angles, a number of different phases of wheel alignment can be studied.

Film Star Tints Hair With Gold

HAIR tinted with gold may become the fashion for evening wear among women, as the result of a vogue gaining headway in Hollywood. The fad was introduced by Ann Dvorak, screen star, following experiments of make-up artists who used gold paint on her hair during the filming of a recent movie to enable the camera to pick up and record a lustrous highlight that is not ordinarily given off by brunette tresses.



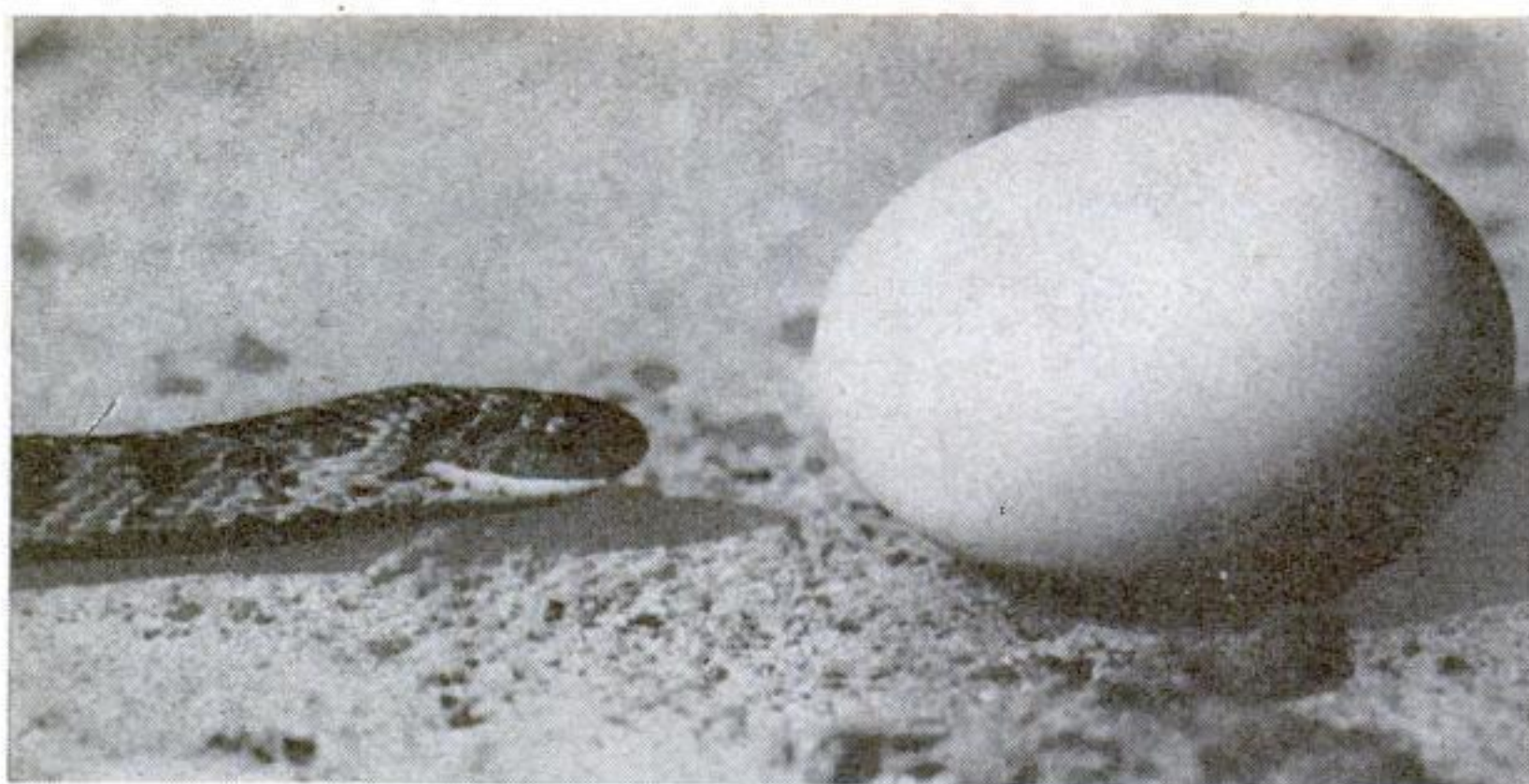
Ann Dvorak having her hair tinted with gold

Safety Reflectors Come in Strips

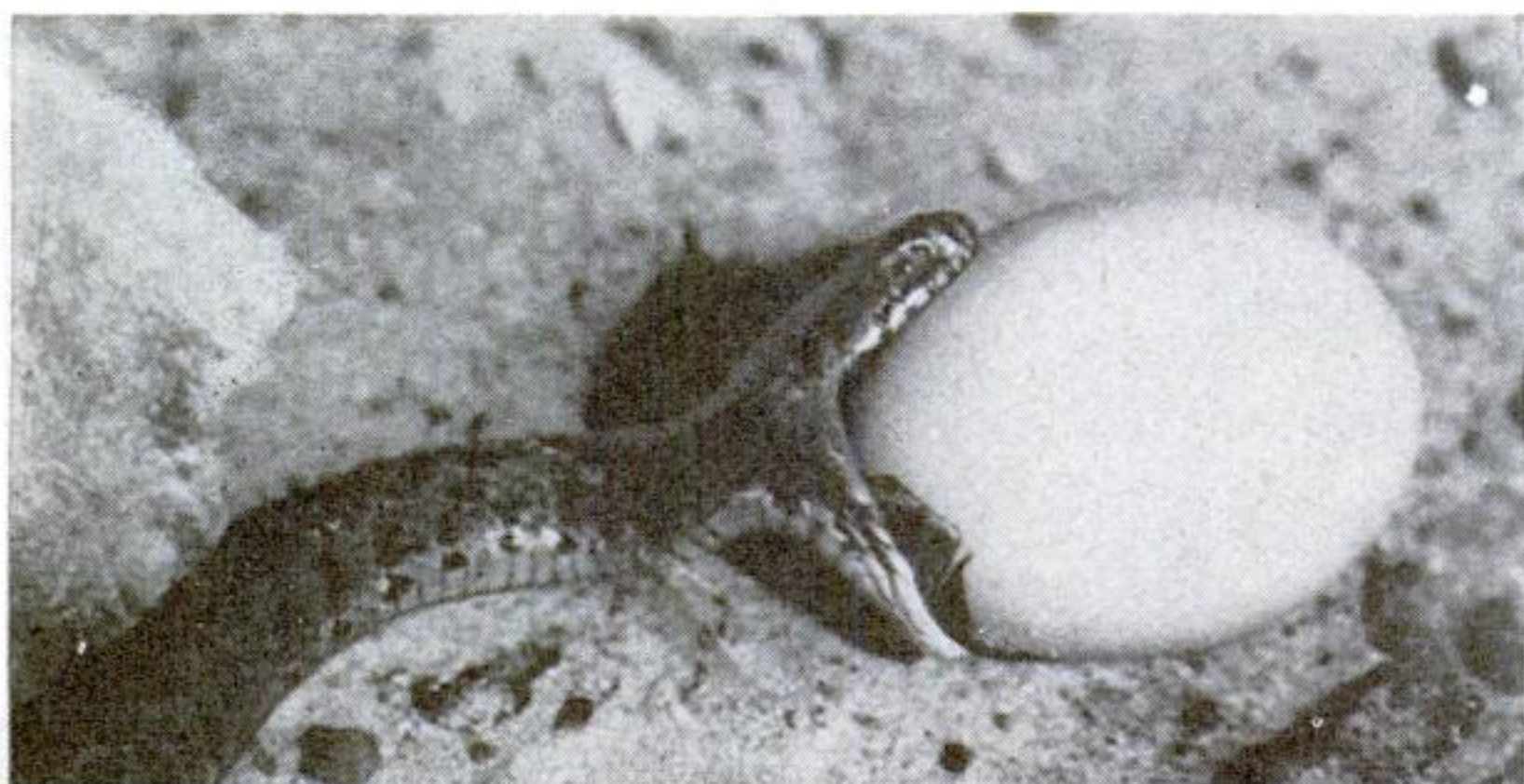
REFLECTING buttons are embedded in thin flexible strips of metal in a new safety product for use as a warning signal on grade-crossing gates, highway obstructions, and other danger spots. Each button has a cluster of seven reflecting lenses. Continuous strips are sold in any desired length.



Lengths of this new safety product can be attached to obstructions in highways



1 The egg-eating snake settles the question of where its next meal is coming from. Equipped with a keen sense of smell, it rejects all but new-laid eggs

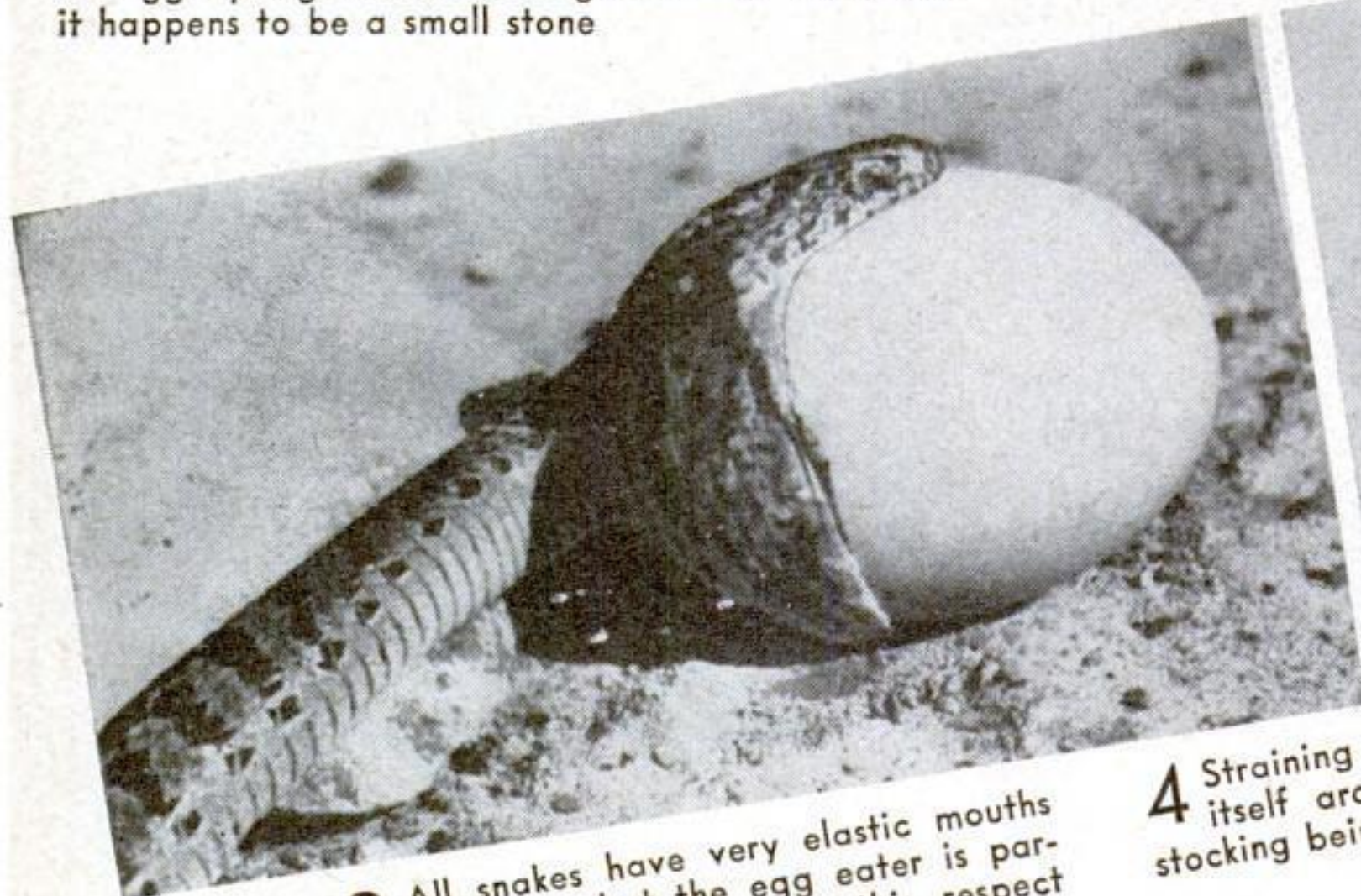


2 In order to get a hold, the snake maneuvers the egg up against something solid—in this case, it happens to be a small stone

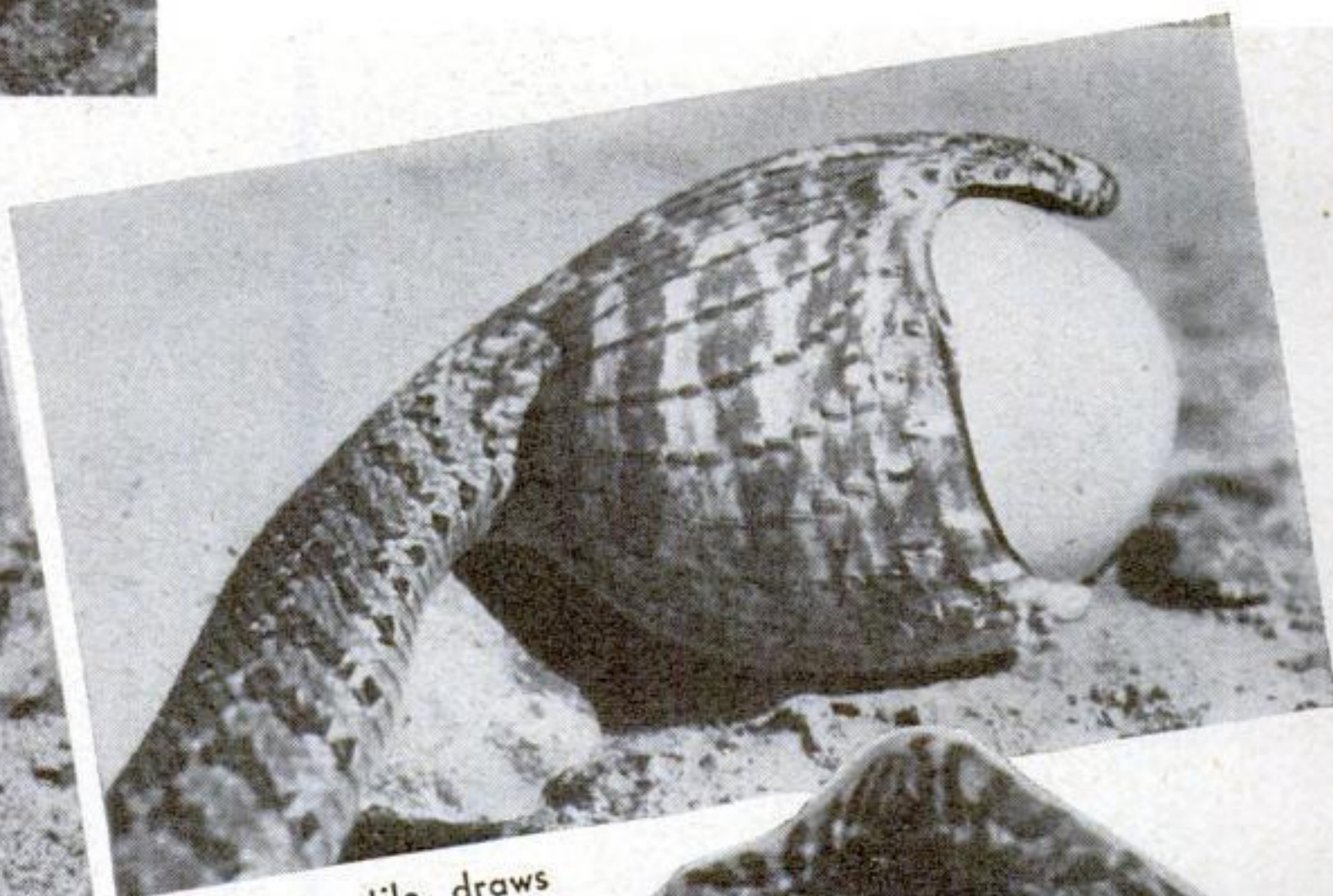
It's a Mouthful!

Odd South African Egg-Eating Snake Does His Stuff for the Camera

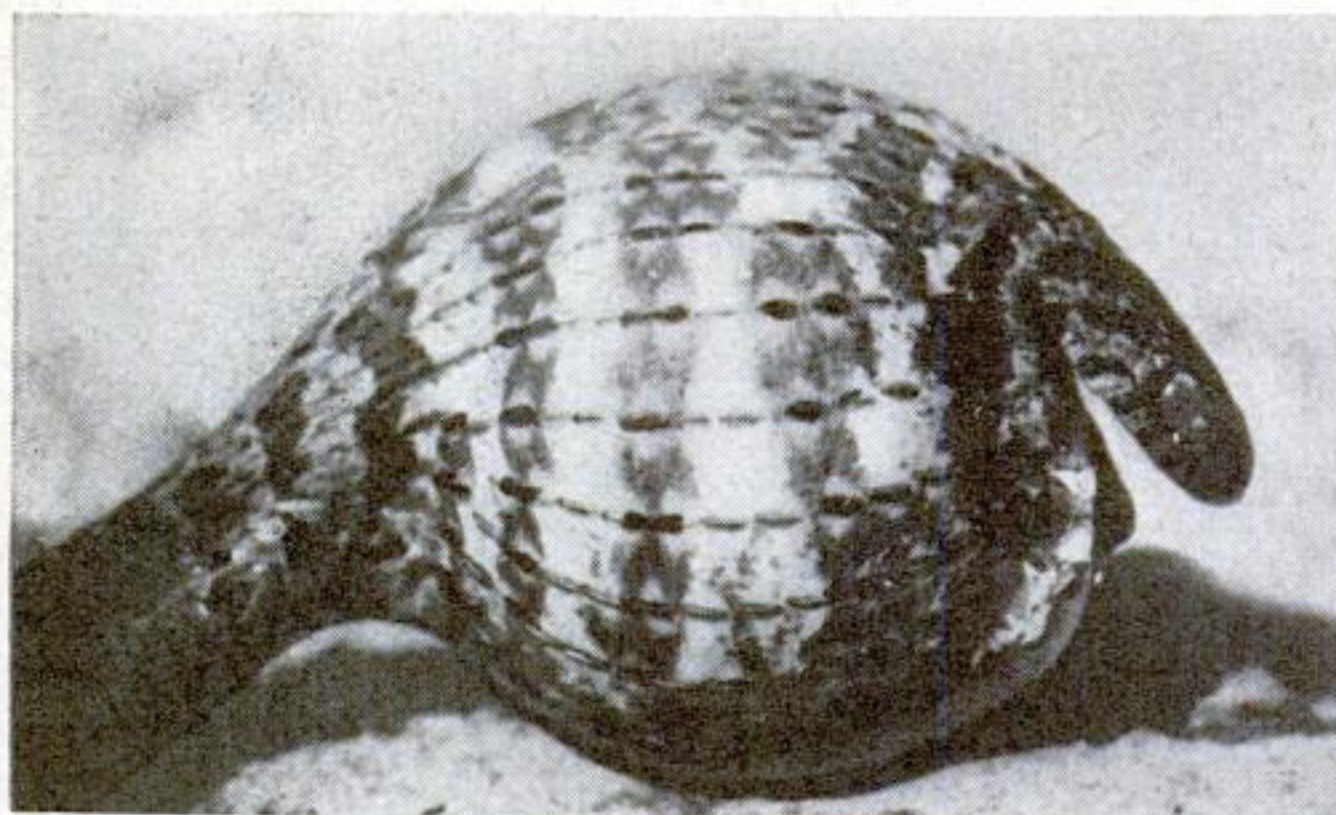
ADAPTED by nature for raiding wild birds' nests and devouring their eggs, a strange South African snake sometimes goes after bigger game. Incredible as it may seem, this tiny reptile, whose head is normally no larger than a man's little finger, can accommodate a full-size hen's egg in its gullet. Slipping its jaws around its meal, the snake brings into action some toothlike projections on its upper vertebræ, which gently crack the shell and penetrate its membranous lining sufficiently to allow the contents to trickle down into the reptile's interior. After the meal has been enjoyed, the shell is expelled, crumpled but still entire. In a remarkable series of photographs, the camera has recorded all the stages of this amazing process.



3 All snakes have very elastic mouths and jaws, but the egg eater is particularly well equipped in this respect

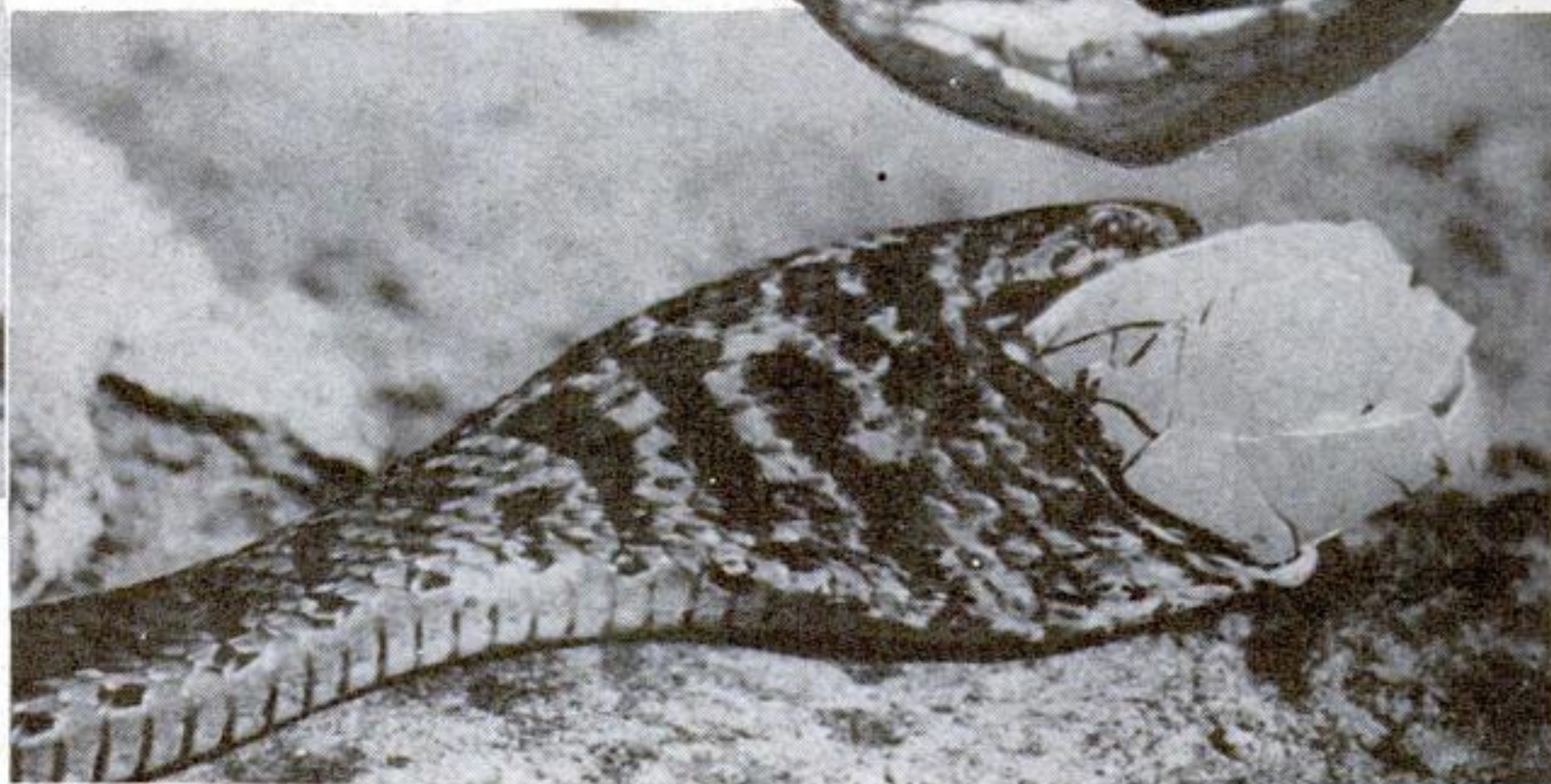


4 Straining hard, the reptile draws itself around the shell, like a silk stocking being pulled on a darning egg

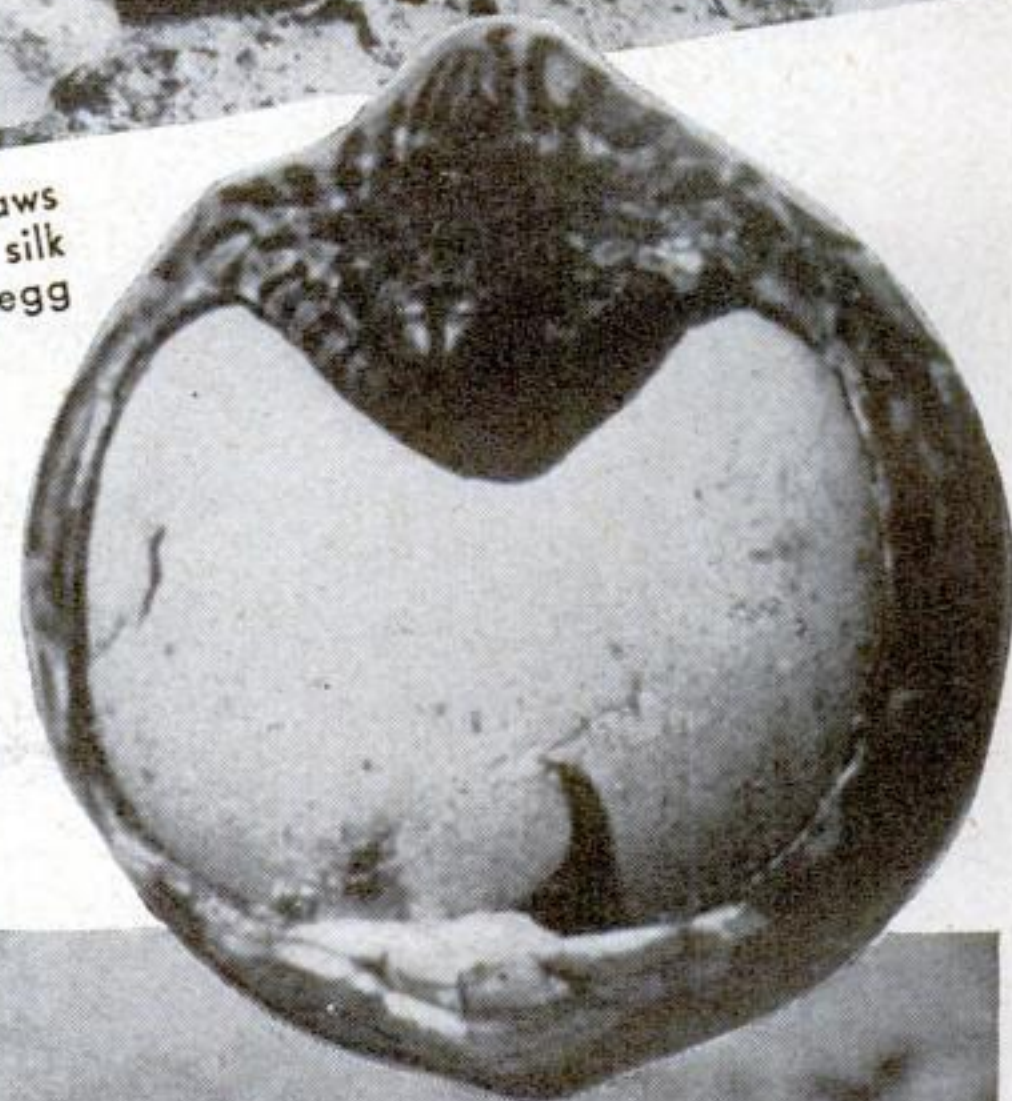


6 When the egg is completely surrounded, toothlike projections on the forward vertebrae crush the shell gently and its contents flow down the alimentary canal

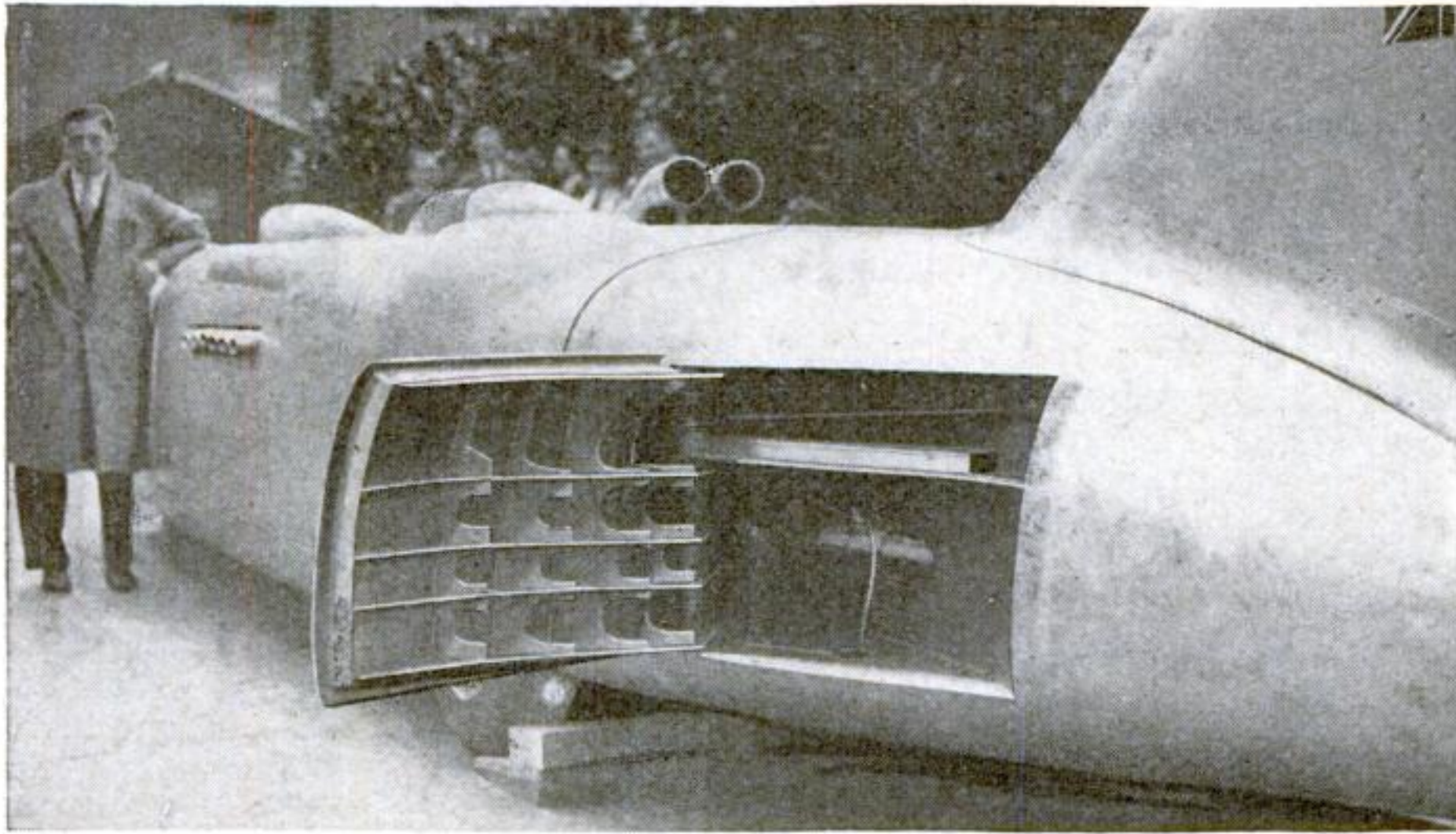
7 The meal completed, the crumpled shell is ejected. Although crushed, it still holds together in its original oval shape



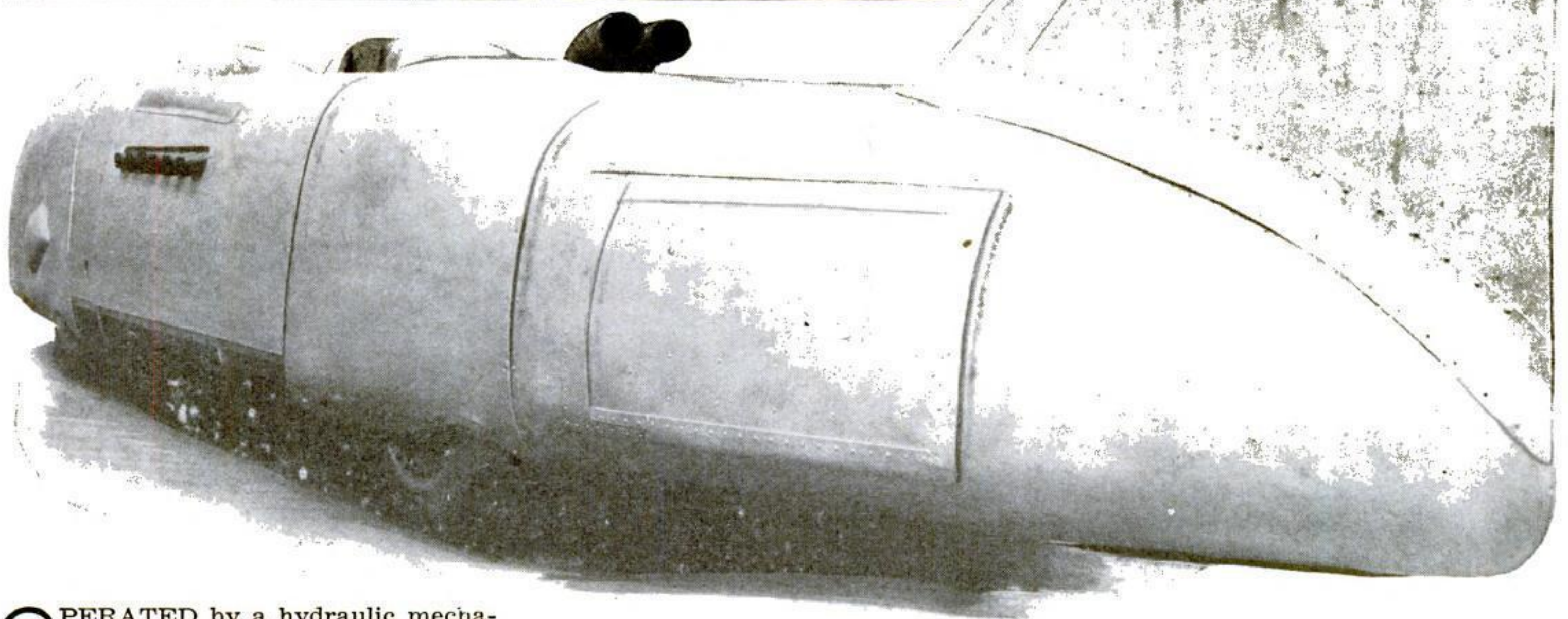
5 In order to be able to breathe, the snake now thrusts its windpipe and tongue forward, as seen in the picture at the right



Wind Brakes Slow Mammoth Racing Car at High Speeds



Capt. George Eyston's racer ready for shipment from England to the United States. At left, one of the wind-brake flaps is opened



OPERATED by a hydraulic mechanism, huge flaps on the sides of the new racing automobile built by Capt. George Eyston (P.S.M., Nov. '37, p. 76) will open out to act as wind brakes for slowing the car down to

speeds at which regular braking equipment can be used safely. If wheel brakes were used at speeds above 300 miles an hour, it is believed, friction

would burn and rip the racer's tires to shreds. The car was built for an attempt to shatter the world's land-speed record.

Novel Cot Folds in Small Space

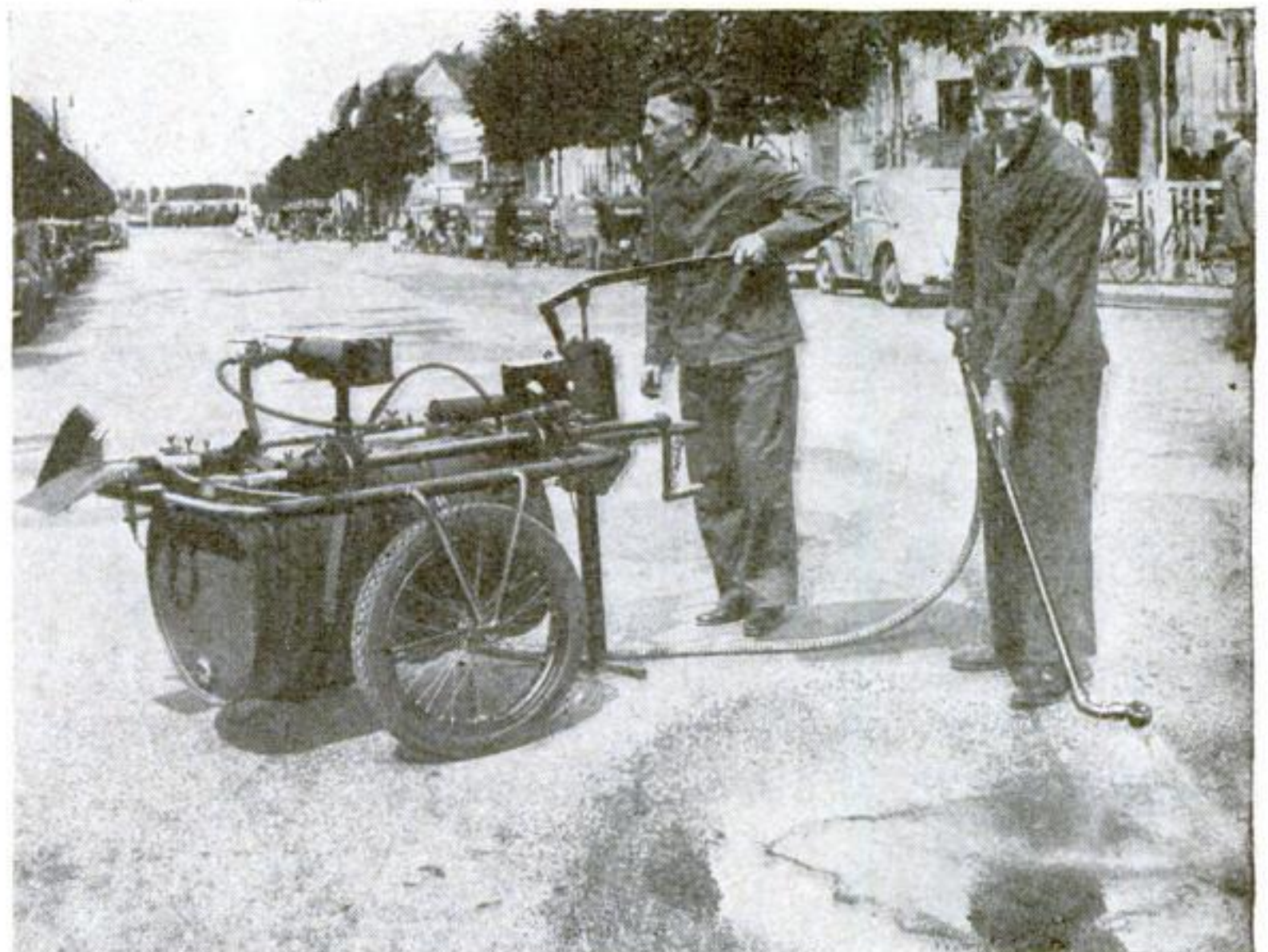
ACCOMMODATING a person over six feet tall, a handy new sleeping cot folds up compactly and fits into a cloth case half the size of a golf bag. When it is set up, detachable springs stretch across the bed and snap onto the sides. An air cushion serves as a pillow for the compact unit.



The cot set up, and the case that holds it when folded

Portable Unit Sprays Oil on Road

EMERGENCY road repairs are made quickly with a portable unit just introduced in Germany. In the photograph below, oil is being sprayed on newly laid gravel by means of an extension hose operated by a hand pump.



A demonstration of the emergency road-repair outfit. It has a hand pump

Flying Lifeboats



"NCU . . . NCU . . . WCEH calling NOR Coast Guard station San Diego."

Across the sea flashed this terse message. In the radio room at the air station an operator pressed the phones tightly against his ears, began tapping out a reply:

"NOR Coast Guard Station San Diego calling. Coast Guard San Diego standing by. Go ahead please."

"This is WCEH calling, tuna clipper *San Salvador* 200 miles south of Magdalena Bay. C. M. Johnson, radio operator, injured foot . . . now infected. Must have medical treatment immediately."

Five minutes later Lieut. S. C. Linholm, commanding the newest of eight Coast Guard air stations whose sixty pilots stand ready day and night to answer sudden pleas for aid on the high seas, was poring over the charts.

"The *San Salvador* lies 850 miles to the south," he mut-

A Coast Guard amphibian landing on the ocean beside a vessel to remove an injured seaman. Below, the patient is being placed inside the plane

tered. "We can carry gas for 600 miles. Only one solution."

A few hours later, the cutter *Calypso* left port bearing 350 gallons of aviation gasoline, bound for Ballenas Bay in lower California, 450 miles south of Point Loma. Coast Guard headquarters radioed the *San Salvador* to put into Magdalena Bay, where the plane would meet her. On the second day, Linholm and a crew of three took off in the big twin-engine amphibian, refueled from the *Calypso*, picked up the injured man, and again refueled at Ballenas Bay. Fifteen hours after leaving San Diego, the plane dropped down in the lee of Point Loma, having flown 1,300 miles and completed the longest assistance flight ever attempted by the Coast Guard.

The injured radio operator had tapped out his own NCU, general call for any Coast Guard unit, and from a position far down the Mexican coast was flown to a distant hospital by the only service of its kind in the world.



Giant Amphibians and the Miracles of Modern Radio Help the U. S. Coast Guard To Carry On Its Tradition of Bringing Timely Aid to Ships and Men in Distress

By
ANDREW R. BOONE



At a landing field ashore, the stretcher is transferred to an ambulance

MAKE THRILLING RESCUES AT SEA

Science in the form of seaworthy airplanes and directional radios, plus daring pilots and crews who stand watch around the clock, carry the traditional Coast Guard service—"saving life and property along the coasts"—from the sea's surface into the air.

Today, these life-saving stations of the air circle the nation, from Salem, Mass., to Cordova, Alaska, and stretch across the Pacific ocean to Honolulu, Hawaii.

Figures seldom tell a dramatic story in themselves, yet when you think of the 5,826,618 square miles of open, often storm-swept, seas searched by Coast Guard planes this year while assisting 322 vessels and bringing 2,028 persons to safety, you get some idea of the vast service rendered.

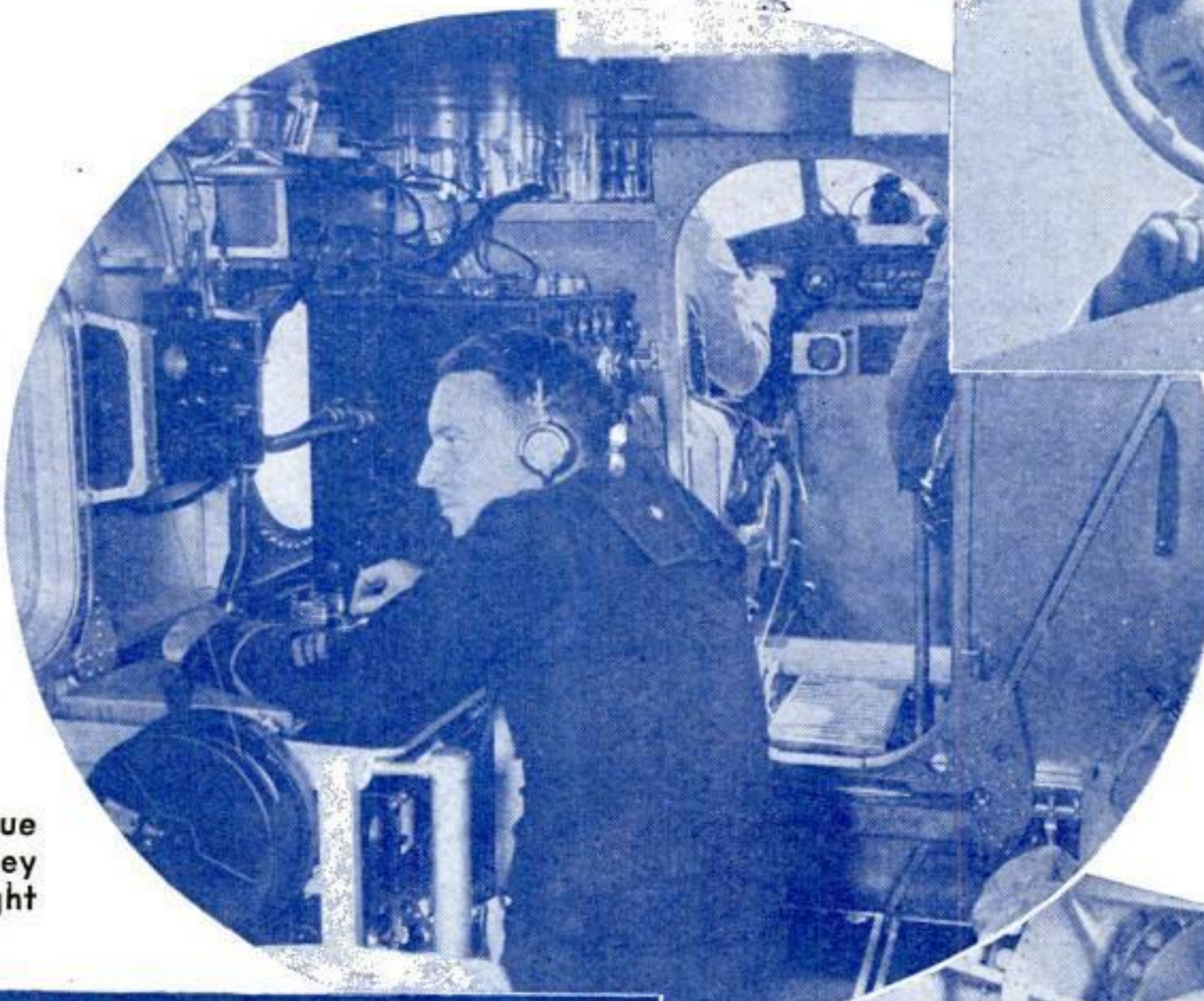
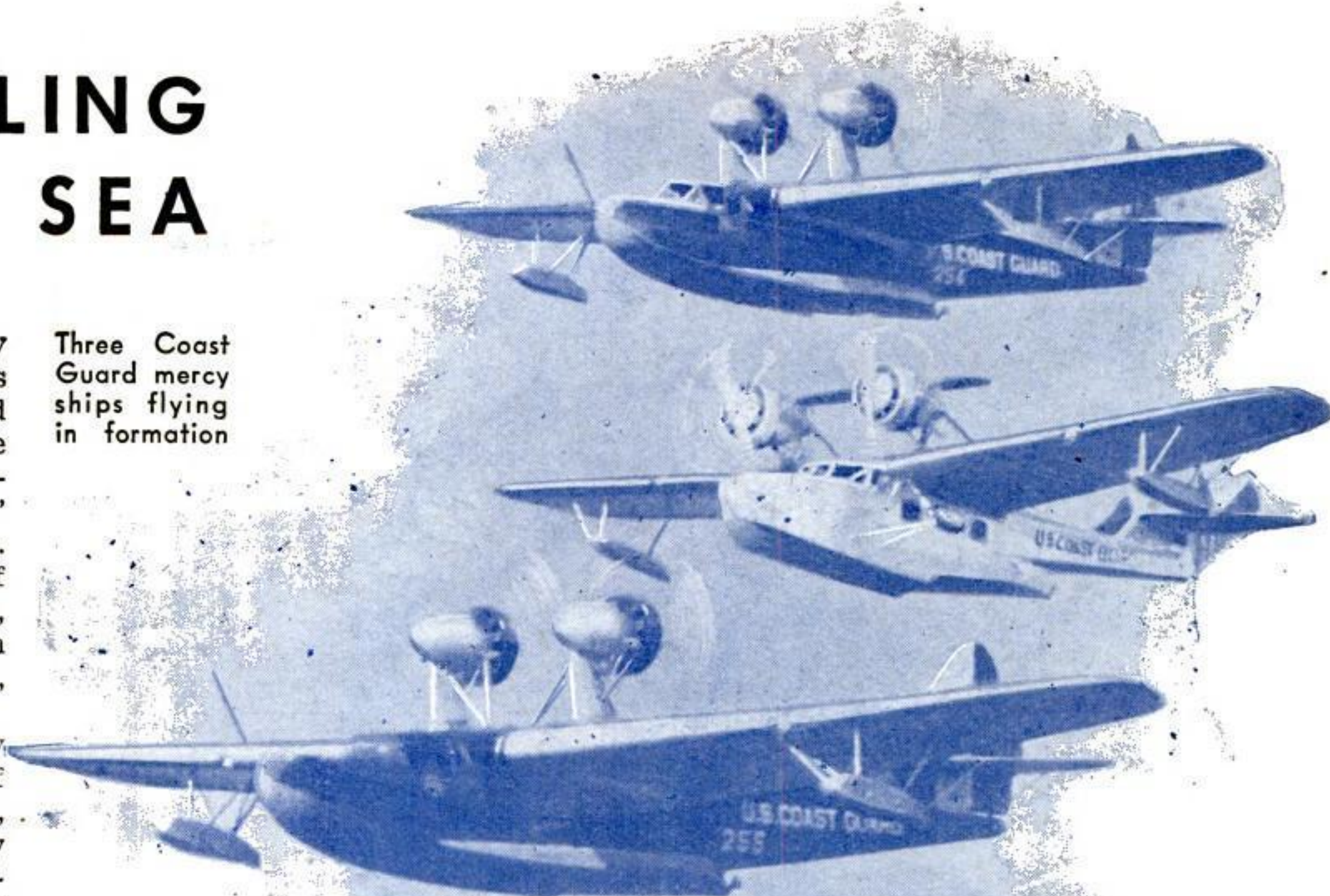
Ships burn to the water's edge. Sailors and passengers become suddenly, critically ill. Storms sweep distant coast lines, peril people afloat and ashore. Venturesome boys are carried to sea in small boats. Anything may happen to people along or on the sea. Call the Coast Guard!

Searching for lost vessels is done by flying a regular pattern, either rectangular or spiral. In the former, the plane speeds to the location where the boat was last reported. It then flies a series of rectangles, covering the probable course of drift, each leg of the flight being separated from the preceding one by twice the range of visibility. To search a calm, windless sea, the plane flies an ever-widening circle.

Acting independently, and in co-ordination (Continued on page 144)

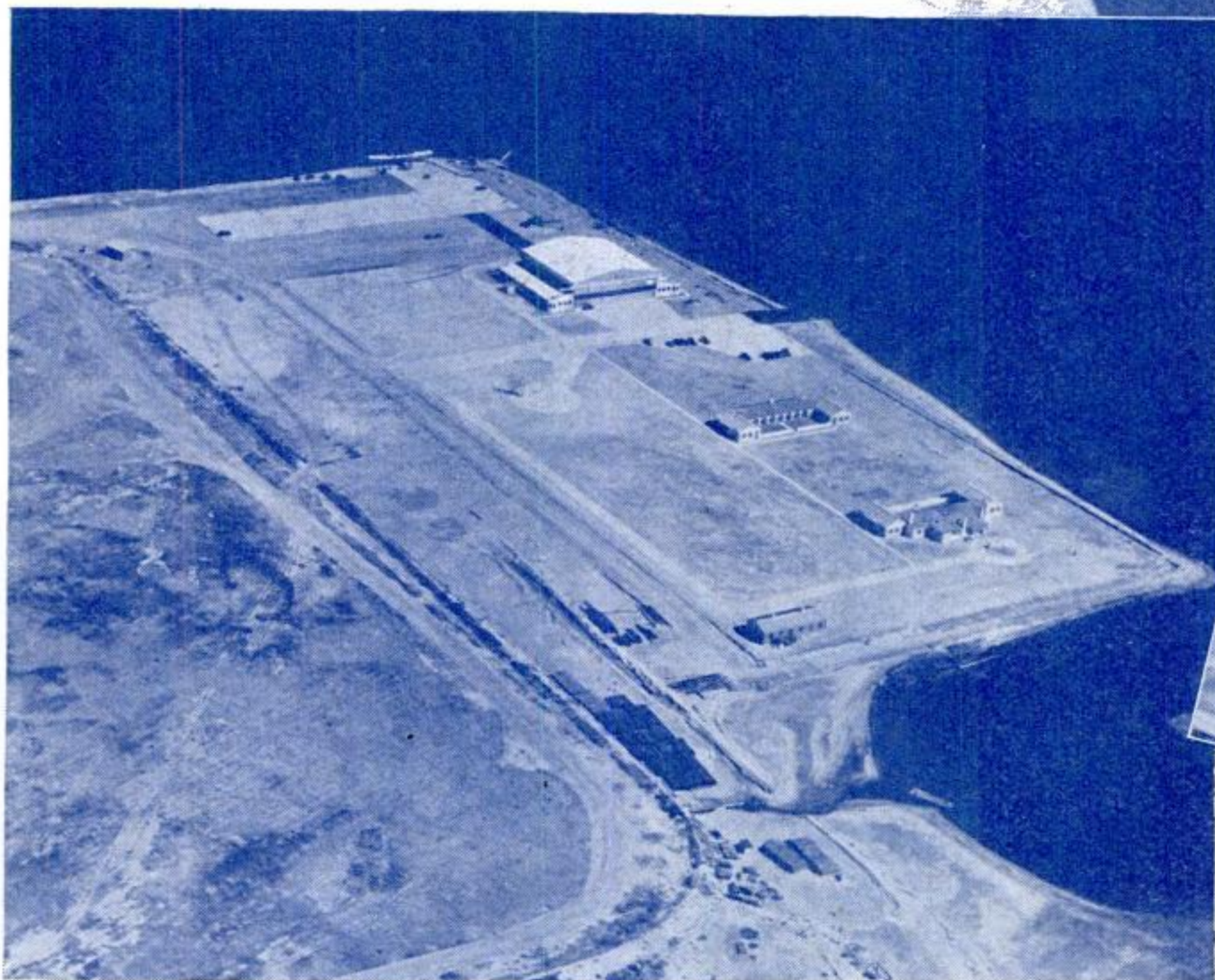
Radio plays a large part in rescue work. Here is an operator at his key in the cabin of a plane in flight

Three Coast Guard mercy ships flying in formation



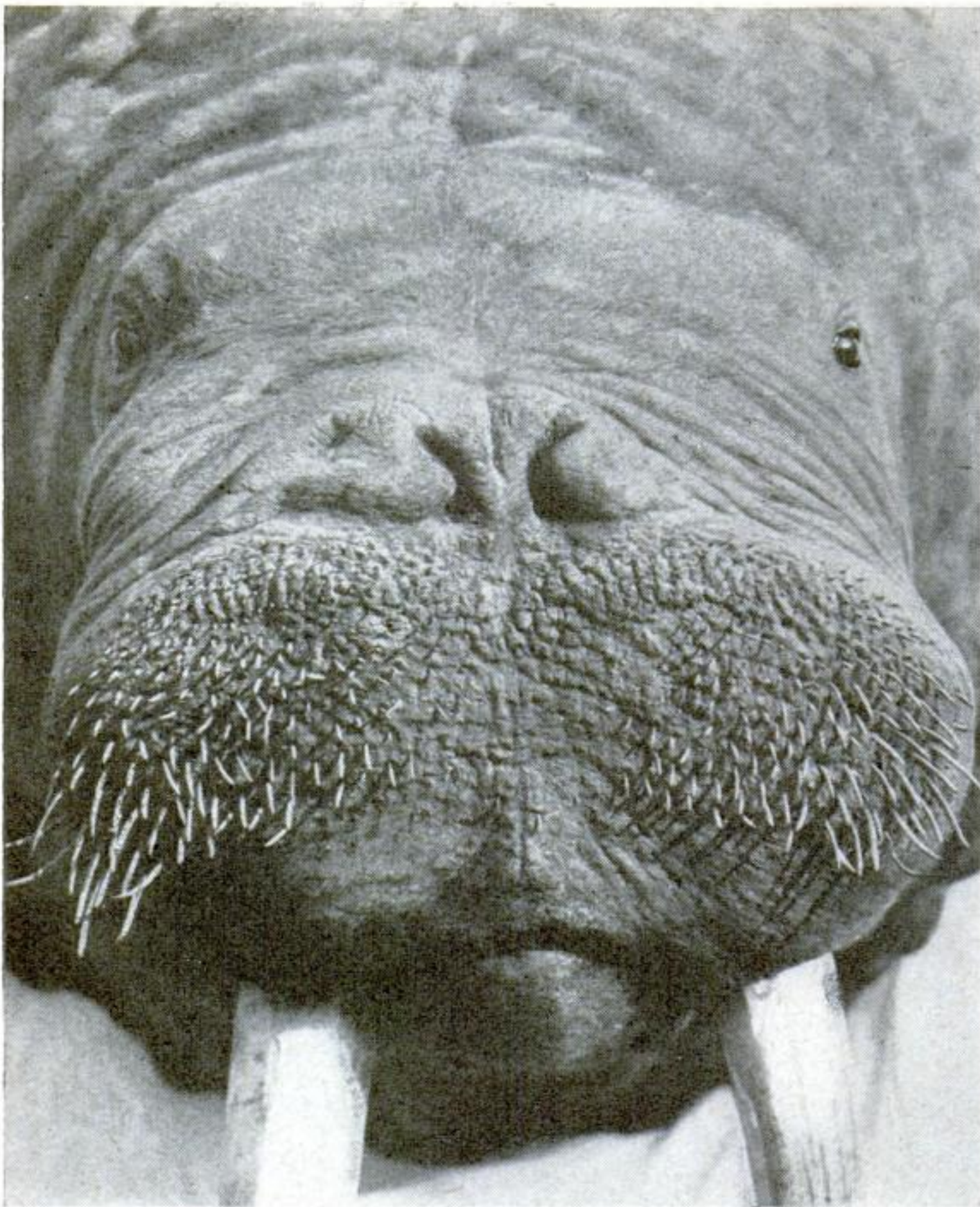
Loop antenna of the direction finder that makes it possible to take bearings on any transmitting station

Below, the navigator plots the course. A flight may take a plane for hundreds of miles to sea

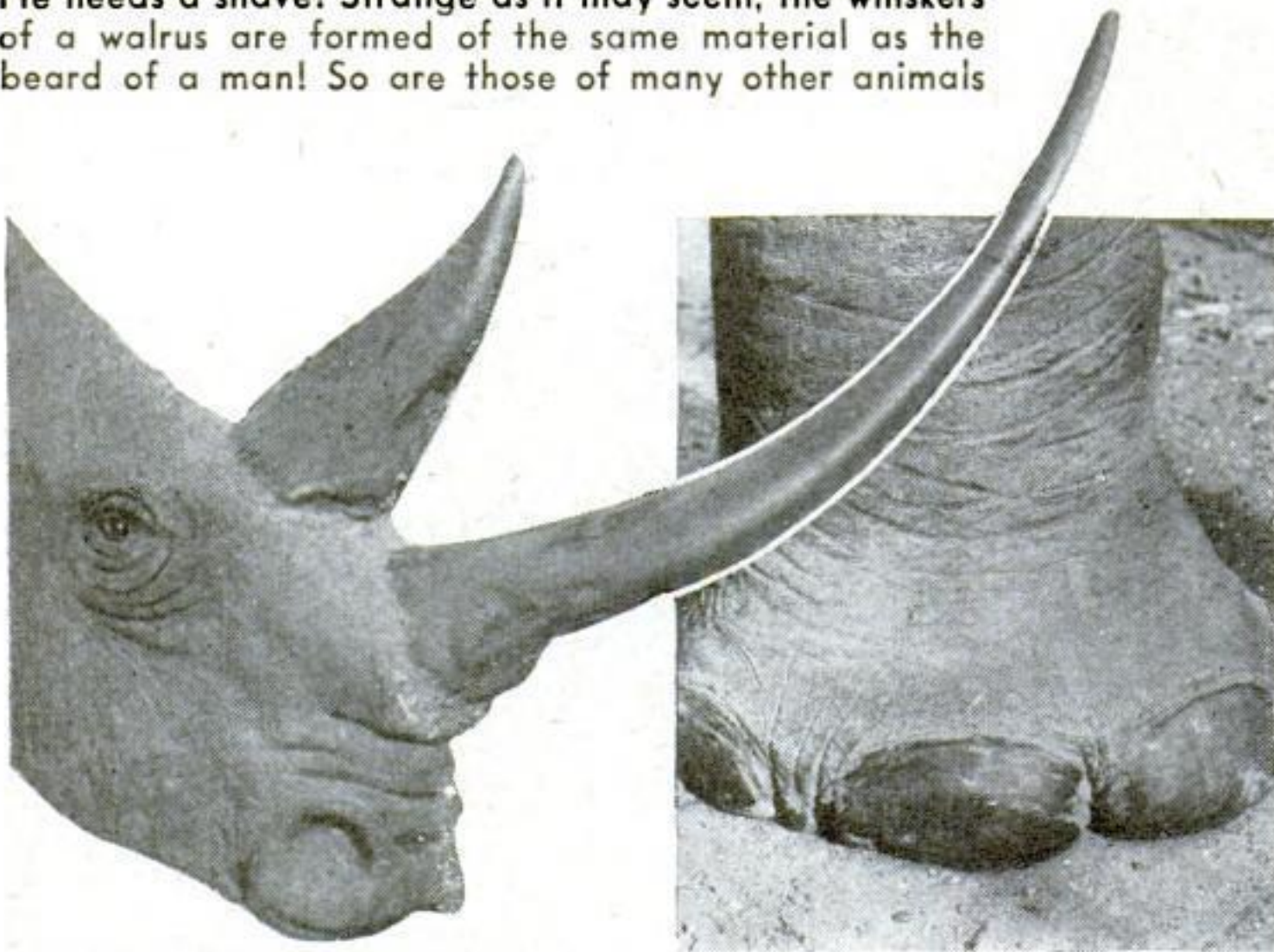


The air station at San Diego, Calif., seen at the left, is the newest of eight fields that dot our long coastline

HAIR....



He needs a shave! Strange as it may seem, the whiskers of a walrus are formed of the same material as the beard of a man! So are those of many other animals



Such widely assorted objects as the toenails of elephants and the horns of the rhinoceros and the water buffalo, also come under the classification of hair

Powered by a flash-light battery, the midget hair remover shown at the right enables a woman to get rid of superfluous growths right in her own home

EVERY day, American men shave off more than 50,000 miles of whiskers and American women remove tons of superfluous hair. Every day, barbers and beauticians rub in lakes of tonic and massage acres of scalps. Getting rid of hair, and stimulating hair growth, both form big businesses that keep an army of Americans employed.

The average man has approximately 350,000 hairs on his body, about 110,000 of them on his head. Women have more hairs on their heads than men; blondes more than brunettes. People with red hair have fewest of all, their heads frequently containing no more than 90,000 hairs, while blondes sometimes have 140,000. For all types of hair, the average scalp holds approximately 1,000 hairs to the square inch.

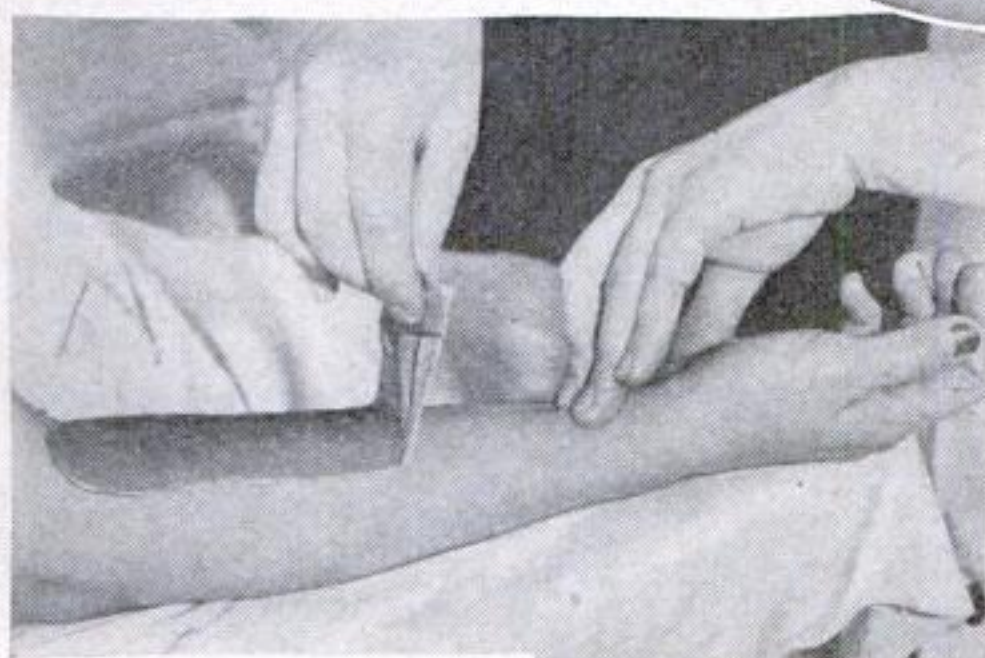
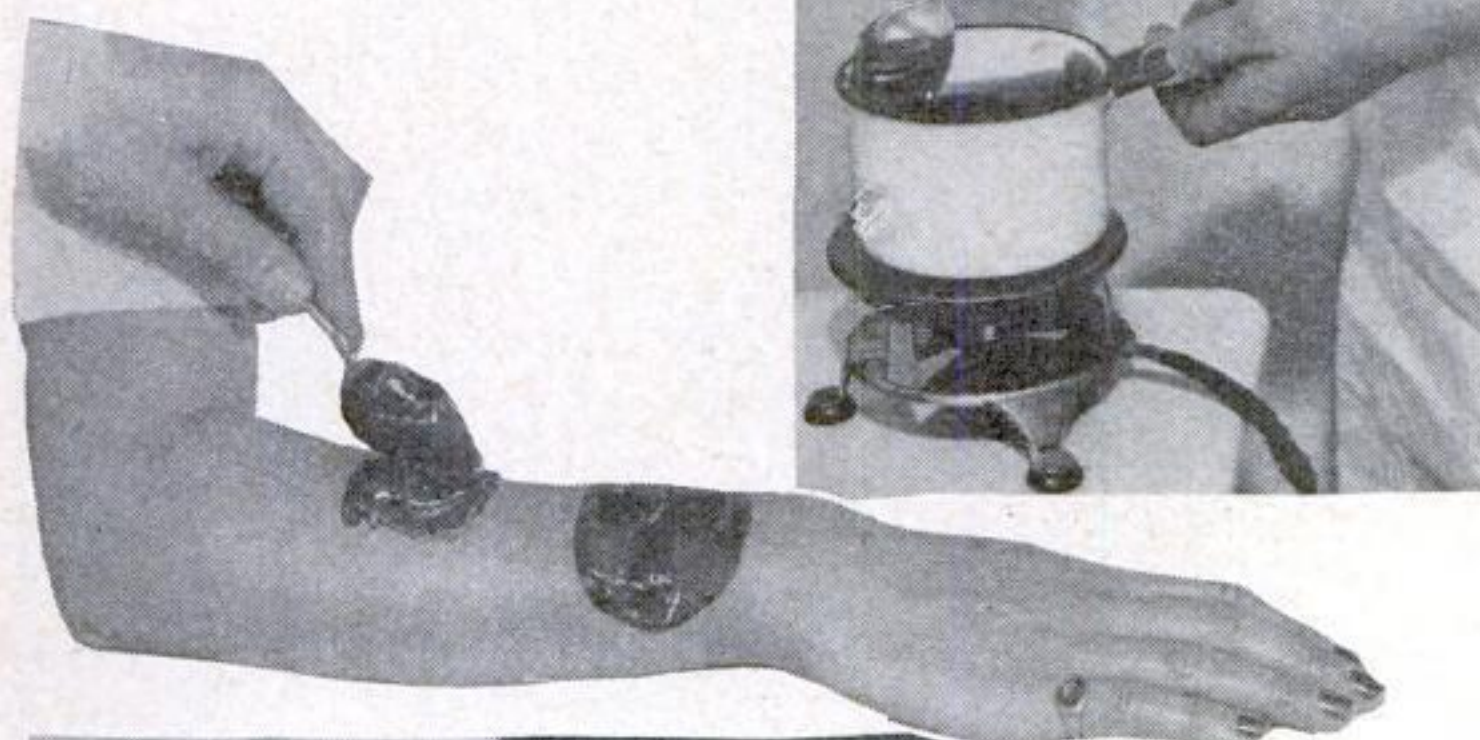
Each of them is formed of horny material with a hollow tube running down the center to a bulb-like root at the bottom. The structure suggests that of a green onion, the stalk representing the hair and the onion the root. All hairs are dead. Only the roots are alive. The whiskers of a walrus, the horn of a rhinoceros, and human hair are all formed of similar material.

Ever since one of the Chinese generals in charge of building the Great Wall devised the hairbrush, inventors have been producing aids to beautifying, stimulating, and removing hairs. Among the latest innovations pictured on these pages is a new wax which removes hairs when it is peeled from the skin. Another advance is a "wireless" electric curler which eliminates the cumbersome overhead cables that have been used to supply current. Electric hair removers, which painlessly destroy the roots, now come in midget home sets contrasting in size with commercial apparatus.



Some Want It, Some Don't

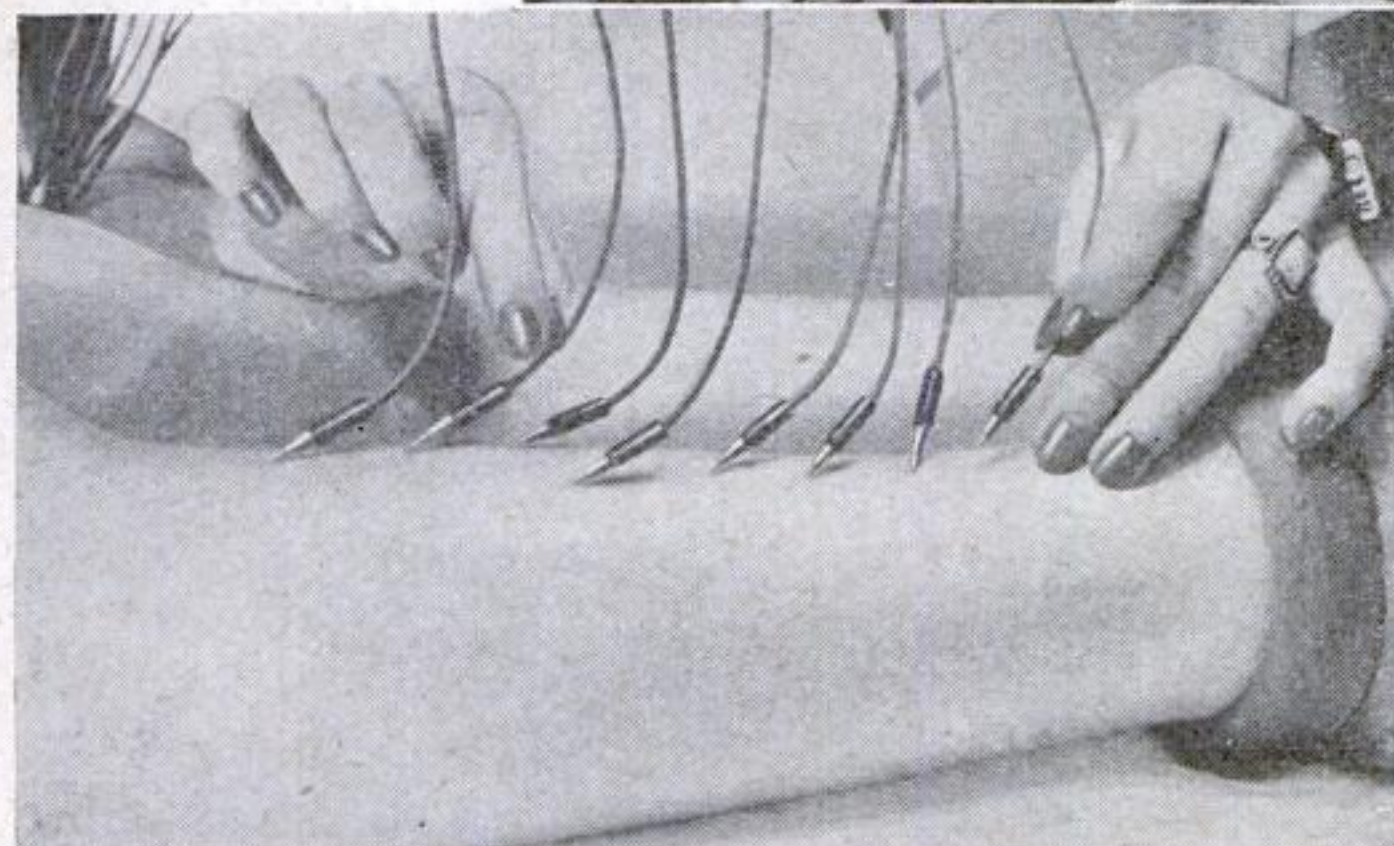
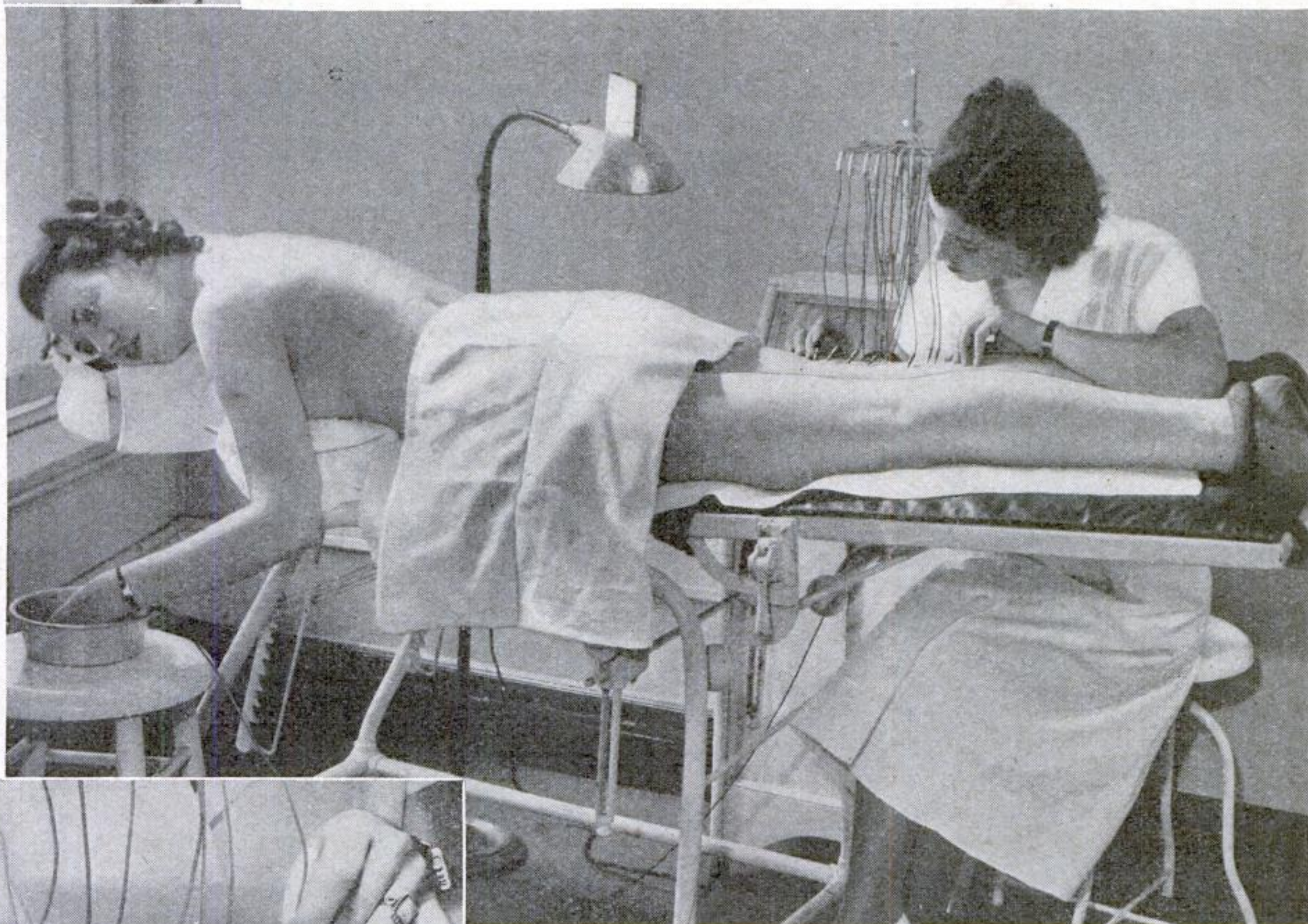
NOW YOU CAN HAVE
YOUR HAIR PEELED OFF
LIKE A SKIN



Another new development for taking off hair is a wax-like preparation that is softened by warming on an electric heater and spread on the skin

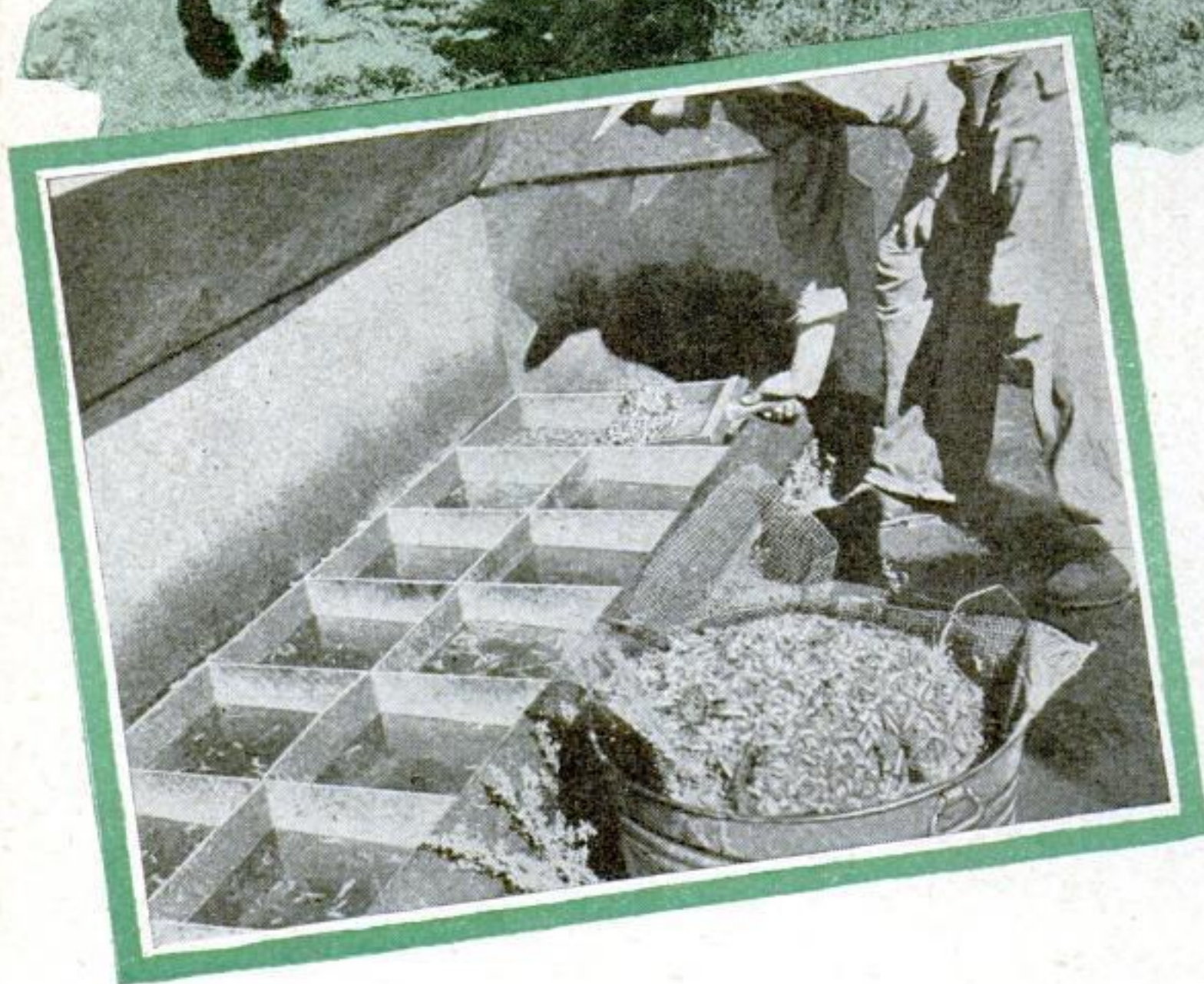
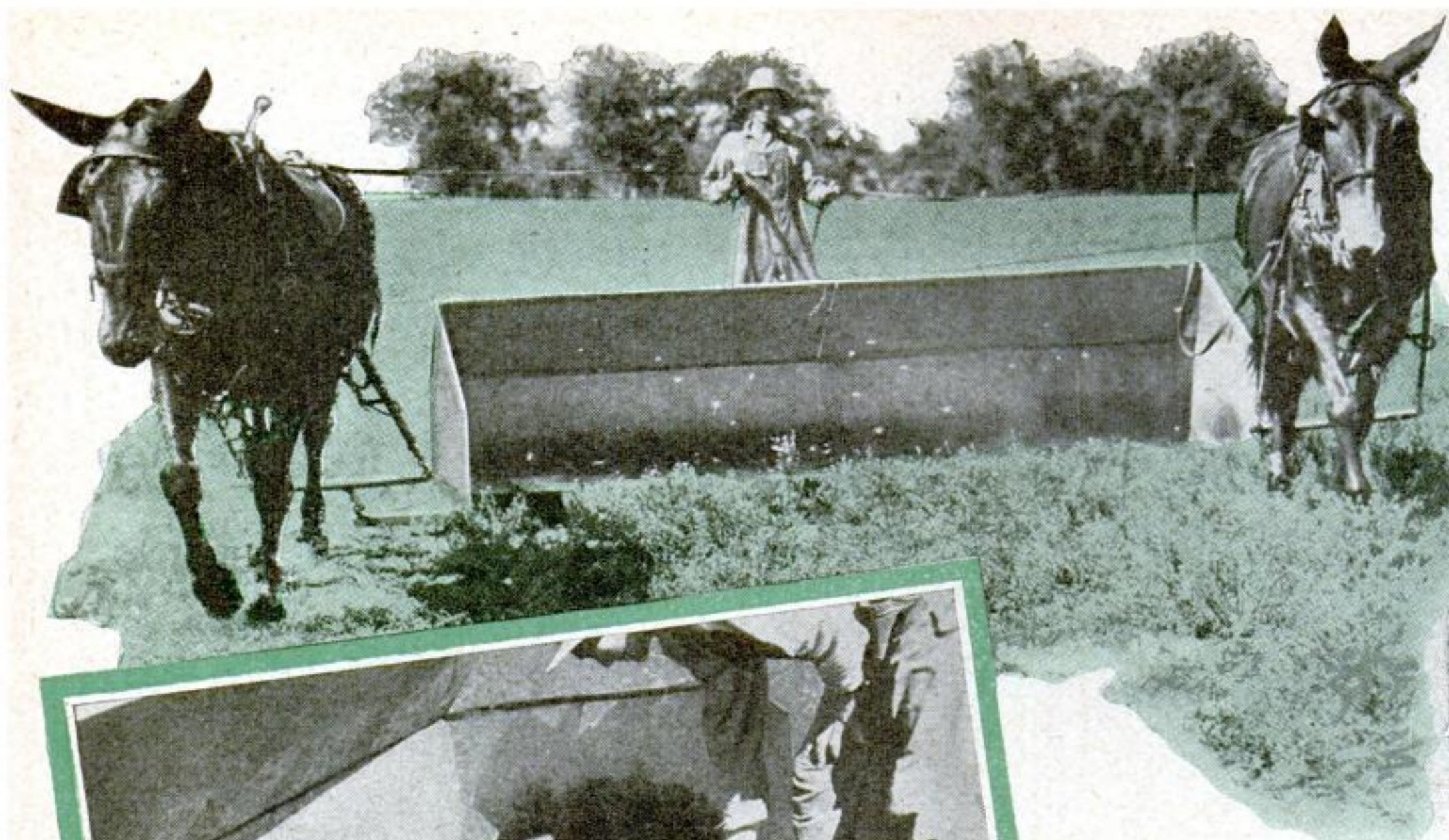
After cooling, it is peeled off as shown above, removing all visible hair growth

Killing
Unwanted Hair
with
Electricity



WIRELESS PERMANENT WAVE. In this new machine, curlers are heated in the rack before applying to the hair, eliminating all wires

A typical commercial apparatus for removing superfluous hair by electrolysis. Tiny needles attached to wires are inserted into the hair pocket and a low-voltage current, which cannot be felt by the patient, kills the hair roots. The patient's left hand is held in a pan of water, with an electrode attached to the wrist, during the entire treatment, to provide the necessary ground connection. Compare this outfit with the one opposite

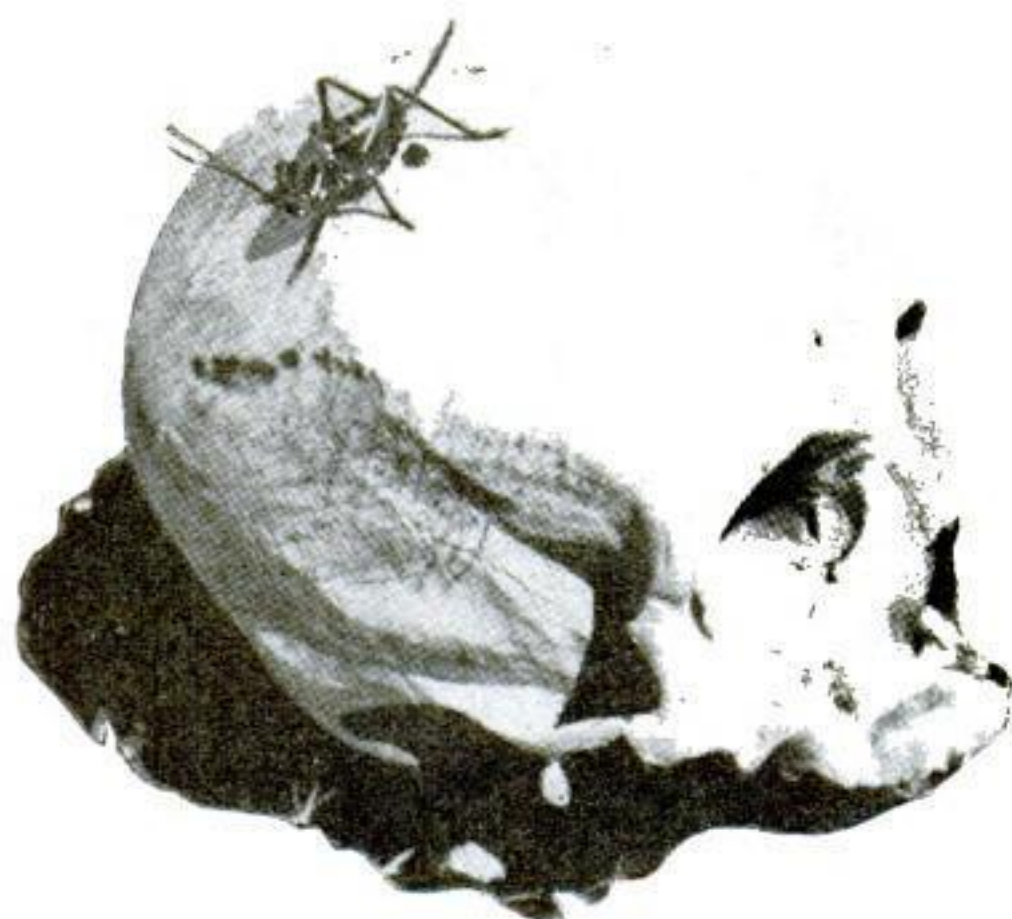


HARVESTING A STRANGE CROP

A "hopper dozer" in action. A skimmer of sheet metal, dragged over a field, knocks the insects into pans containing oil which suffocates them. They are scooped out, as at the left, and burned



War on GRASSHOPPERS



A grim symbol of a modern Egyptian plague

MOBILIZED in haste to meet an invading enemy that was laying waste the country, an army of 20,000 men last summer waged one of the strangest campaigns in human history—a struggle that may rank as the first major engagement in man's war with his insect foes.

Organized on a military basis and directed by scientific experts, state and Federal agencies joined forces to block the path of a horde of billions of migratory grasshoppers, and to destroy them before they could grow wings and launch an aerial attack that would spread an Egyptian plague over some

of the richest farmlands of the nation.

The story of how science forecast, prepared for, and fought the 1937 grasshopper war begins with Sam McCampbell, Colorado entomologist, entering the area known as "the Great Dust Bowl" late in the autumn of 1936. It would seem that enough destructive forces had spawned in the Dust Bowl, but McCampbell discovered another plague nested there.

Each season, the state experts poke around irrigation ditches, fence rows, stubble fields, and fallow ground, taking a census of eggs laid by destructive insects so they can forecast what is to be expected when the hatch starts the following spring. In the fall of '36, in the Dust Bowl area, McCampbell found such a concentration, such a quantity of eggs laid by the migratory grasshopper, that he knew immediately a fight lay ahead.

Ordinary grasshoppers, without wings or with such limited wing area that they cannot fly any great distance, al-

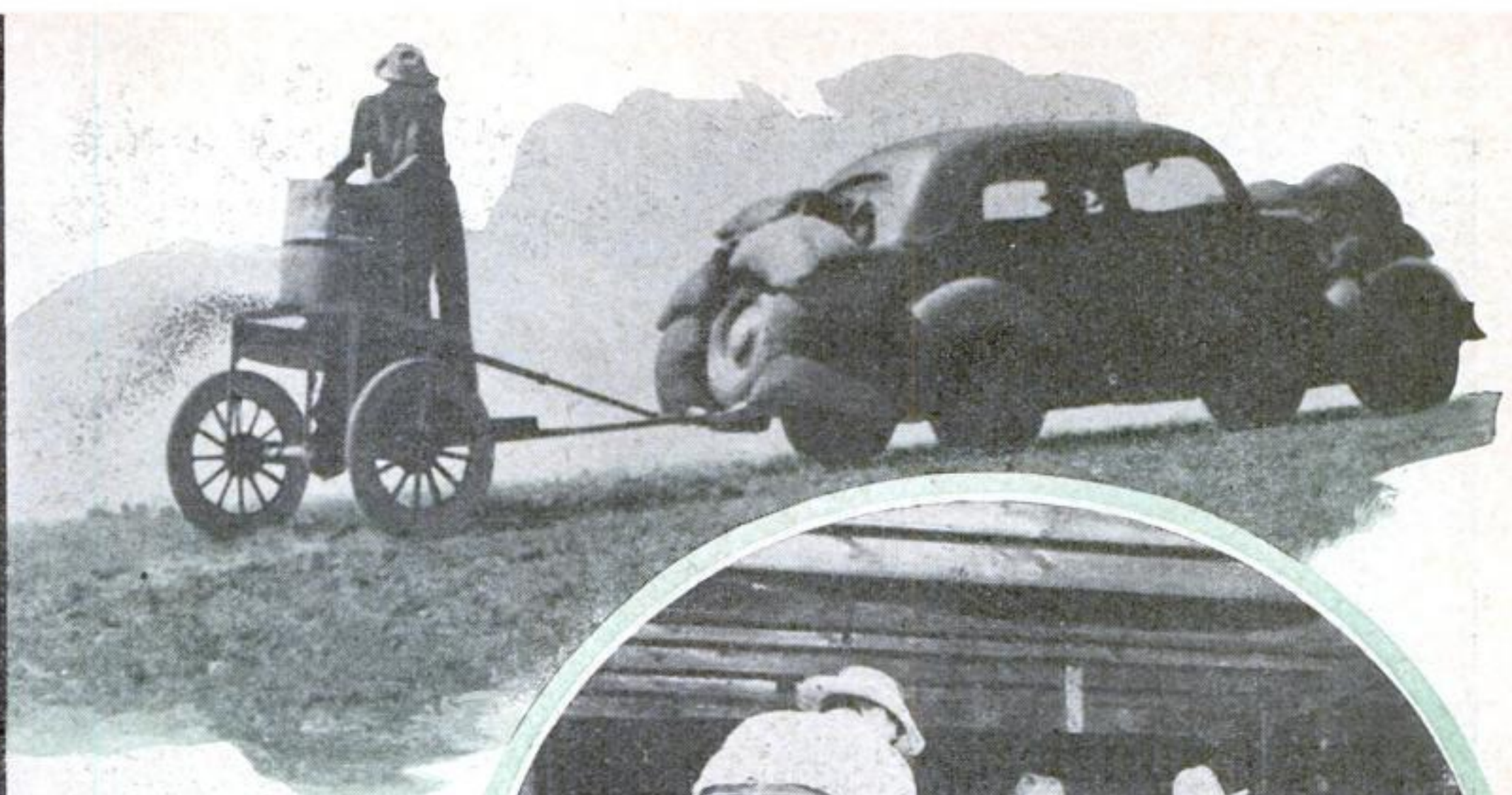
ways remain a local problem. But the migratory type, able to fly for miles, are a threat to an entire region. In addition to the damage done by the seasonal hatch, great clouds of them may be carried across state lines to lay fabulous quantities of eggs in another section, making trouble for the year to follow. The infestation in the Dust Bowl, identified as the migratory hopper, made the find of more than local importance.

Where these hoppers came from there is no way of ascertaining. They may have floated in on an east wind from the Texas Panhandle country. An adult female lays seventy to ninety eggs in a ground burrow, sealing the top with an impervious plate of waterproof substance. There were millions of these nests, and the entomologists proceeded to make counts on measured areas. Then they knew that when June arrived in 1937, the ground in that section would be crawling with the pests.

For the first ten days to two weeks

Here's the Dramatic Story of One of the Strangest Campaigns in History, with Ingenious Machines and Scientific Methods Marshaled to Avert a Plague from America's Richest Farmlands

By ARTHUR HAWTHORNE CARHART



CHEMICALS SAVE THE FARMLANDS

An ingenious device, made from a car axle, scattering poison in the enemy's path. The bags piled on the tow car contain more ammunition. The men at the right are mixing the deadly bait. At left, a corn field before and after a visit of the grasshoppers



Halts Insect Invasion

after hatching, the migratory hopper is wingless. Therefore, these insects had to be destroyed in the first ten days, or they would take to the air and winds could spread them far and wide. With these facts in hand, McCampbell began mustering the human counterattack. He talked to state officials, county agents, individual farmers, and agricultural organizations. Without any wide publicity, they got ready for war.

The news story of the grasshopper invasion broke on the general public at the time the hatch began in the infested area. Public interest lifted higher as Governor Teller Ammons of Colorado issued a proclamation declaring a state of emergency, calling out the National Guard on a war footing, and appealing for concerted community effort to meet a crisis. The campaign was put in charge of Adjutant General Alphonse P. Ardourel. With military precision, the fight started.

In a ten-square-mile area where the migratory hopper had nested, there were twenty-five young hoppers to the square foot. In that one flock, there were at least 7,000,000,000. They crawled in a continuous sheet over the ground. Each day they traveled an average of two miles. In their wake the earth was stripped. Unable as yet to fly, the hungry hoppers chewed at fence posts, clothing, hair on cattle—practically anything they could find that

would fill their hungry little stomachs.

The human army went into action. General Ardourel tried to kill the insects with dynamite bombs placed at different heights on laths. That failed; it got some, but most of the hoppers were merely shaken up and tossed about.

Sam McCampbell had tried poison gas, but it was discarded as inadequate and dangerous to other living things. Hoppers were trapped in plowed furrows, sprayed with oil, and burned, but this method was effective only in a limited way. The main ammunition of the human defenders had to be poison—literally trainloads of it.

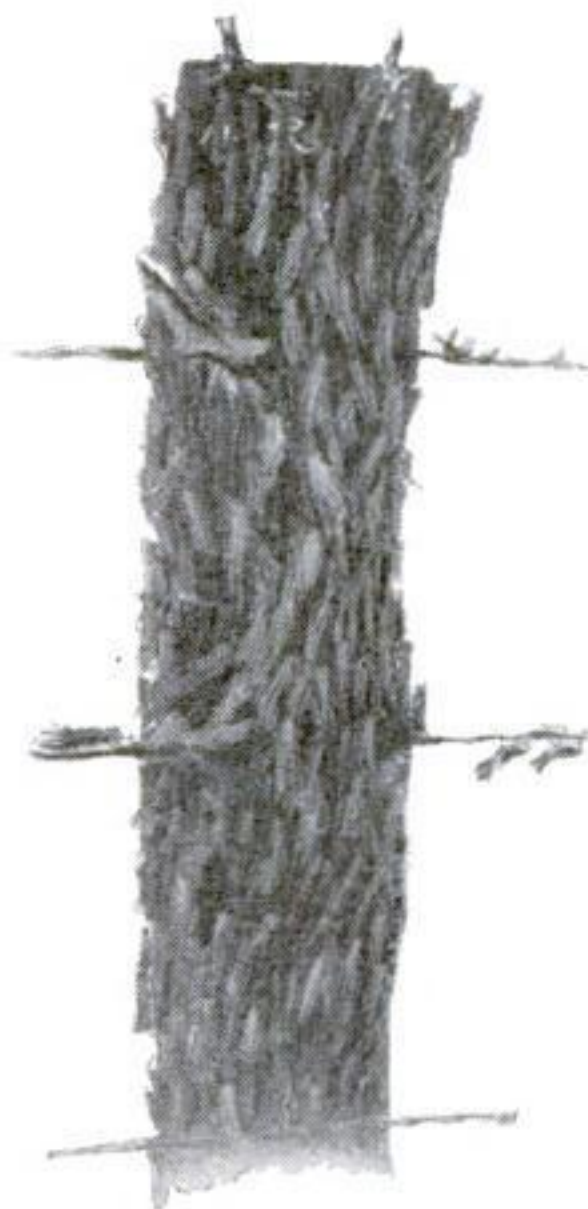
"Our work," General Ardourel told me, "was ninety-nine percent transporting sawdust."

Sawdust? Absolutely. The entomologists had seen how hungry hoppers would eat fence posts. Before this time, poison baits had been made of bran, but in the quantity now needed the cost of bait made wholly of bran would be prohibitive. In the National Forests were old sawpits and little mountains of sawdust wait-

ing. By tests, a formula in the ratio of four sacks of sawdust, one half sack of bran, two gallons of sodium arsenite, eight ounces of amyl acetate, fifteen gallons of water, and two gallons of residue molasses (a by-product of beet-sugar refining) was found effective.

That is the ratio, but stop thinking in terms of sacks. There had to be literally carloads of this poison spread to stop the march of the hoppers.

Besides the National Guard, the CCC, the U.S. Forest Service, the Bureau of Public Roads, the WPA, the Soil Erosion Survey, the Colorado Courtesy Patrol, and the State Highway Department were tied into the campaign. Camps were established at some eight points in the state. An average of 125 big trucks in convoys began hauling sawdust to the mixing plants. A highway steam shovel loaded trucks, three bites to a load. At the start, the truck convoys made as much as 500 miles a day. Even that was not fast enough. The railways



After destroying crops, the grasshoppers ate fence posts

(Continued on page 140)



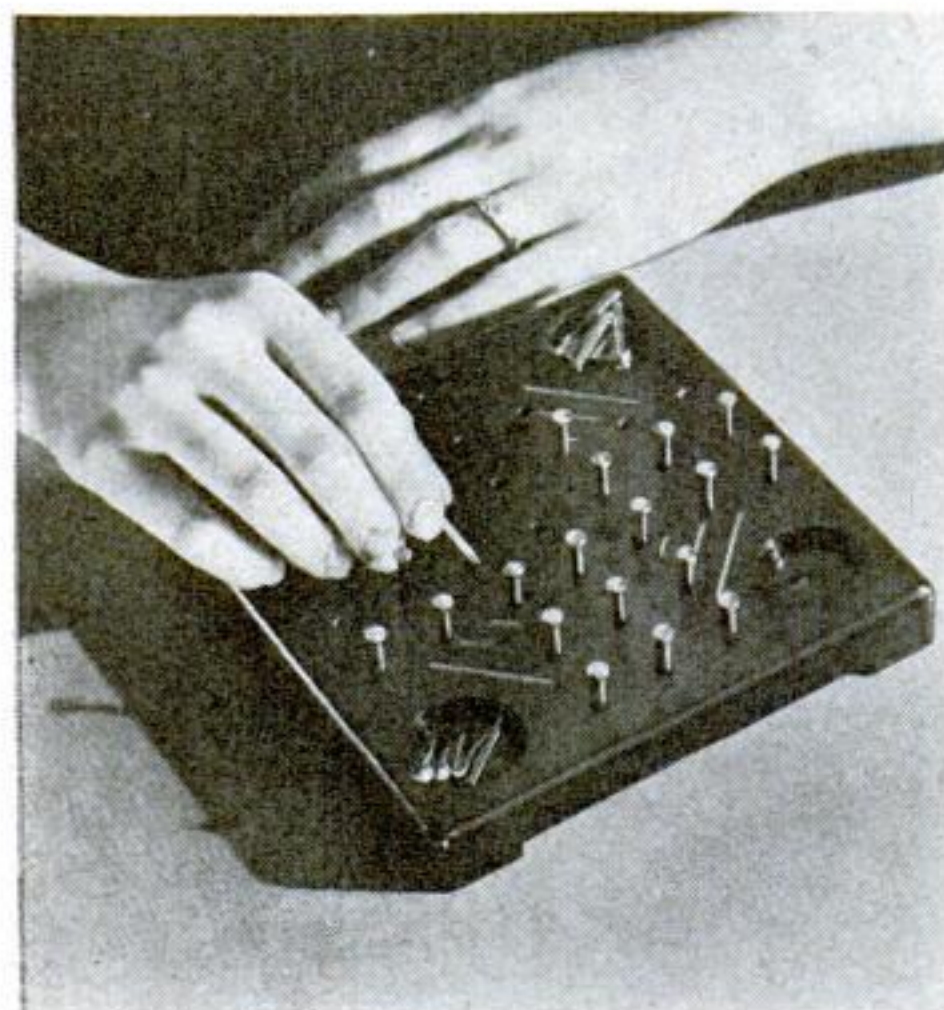
Posing for long hours under hot, glaring studio lights holds no terrors for this "young lady"

Manikin Replaces Living Model In Television Rehearsals

CHRISTENED "Patience," a life-size manikin of the type commonly employed as a dress model in store windows serves as a "stand-in" during extensive television experiments now being conducted by the National Broadcasting Company in New York City. Because long periods of posing under huge batteries of strong lights would be too tir-

ing and too injurious to the eyes of human models, engineers had the dummy substitute shown in the photographs built to their specifications in a dress-model factory. The manikin can be posed in any position and can be made up with various shades of rouge, lipstick, and powder to determine the best make-up for television use.

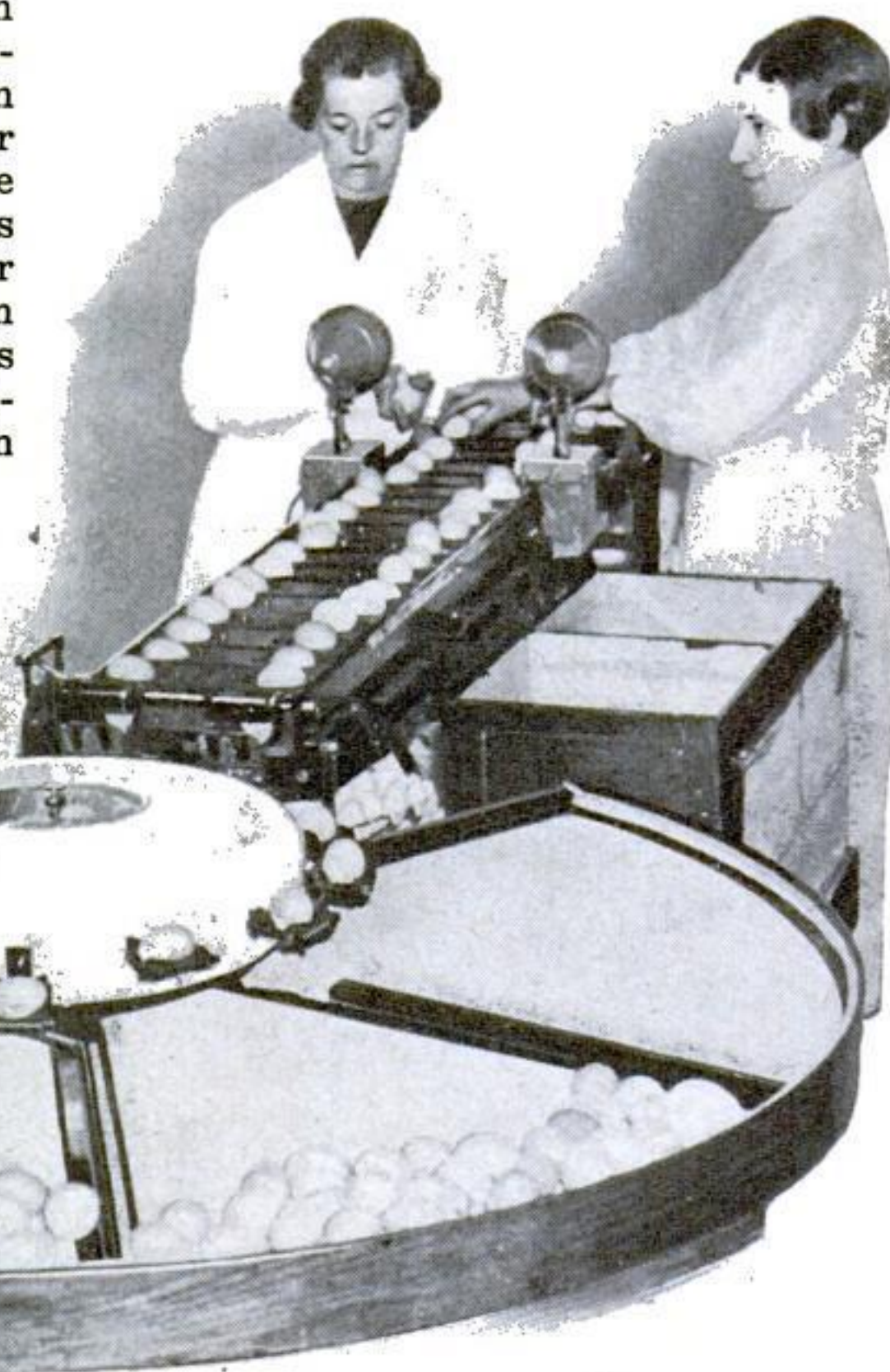
Television experts, in oval, give approval to pretty "Miss Patience," who is getting measured for a dress in the lower picture



Automatic Machine Weighs and Sorts Eggs

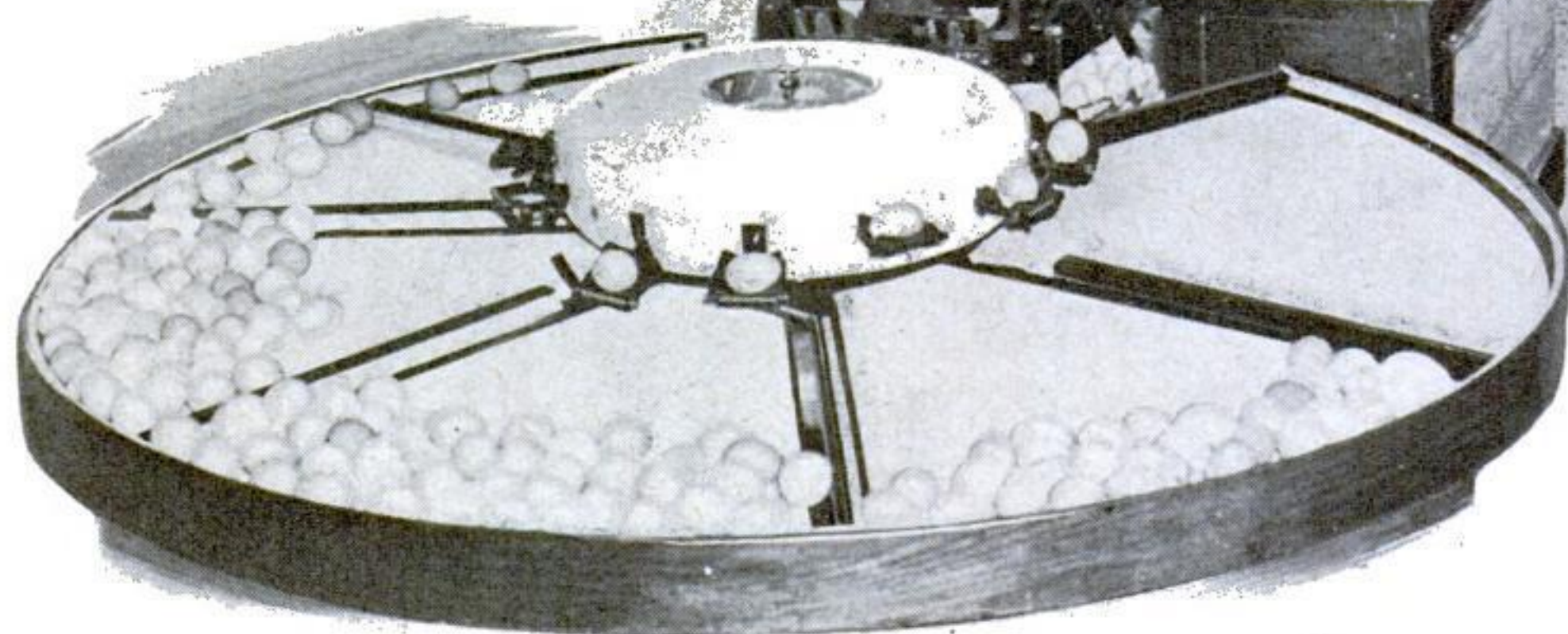
AUTOMATICALLY sorting 3,600 eggs an hour, a novel machine recently displayed at an agricultural exhibition in England separates the eggs into four grades according to weight. Eggs are fed down a moving ramp to receptacles on the revolving center of a circular table that is divided into segments. An automatic mechanism rolls the eggs into their proper segments. The high-speed grader is shown in operation in the photograph below.

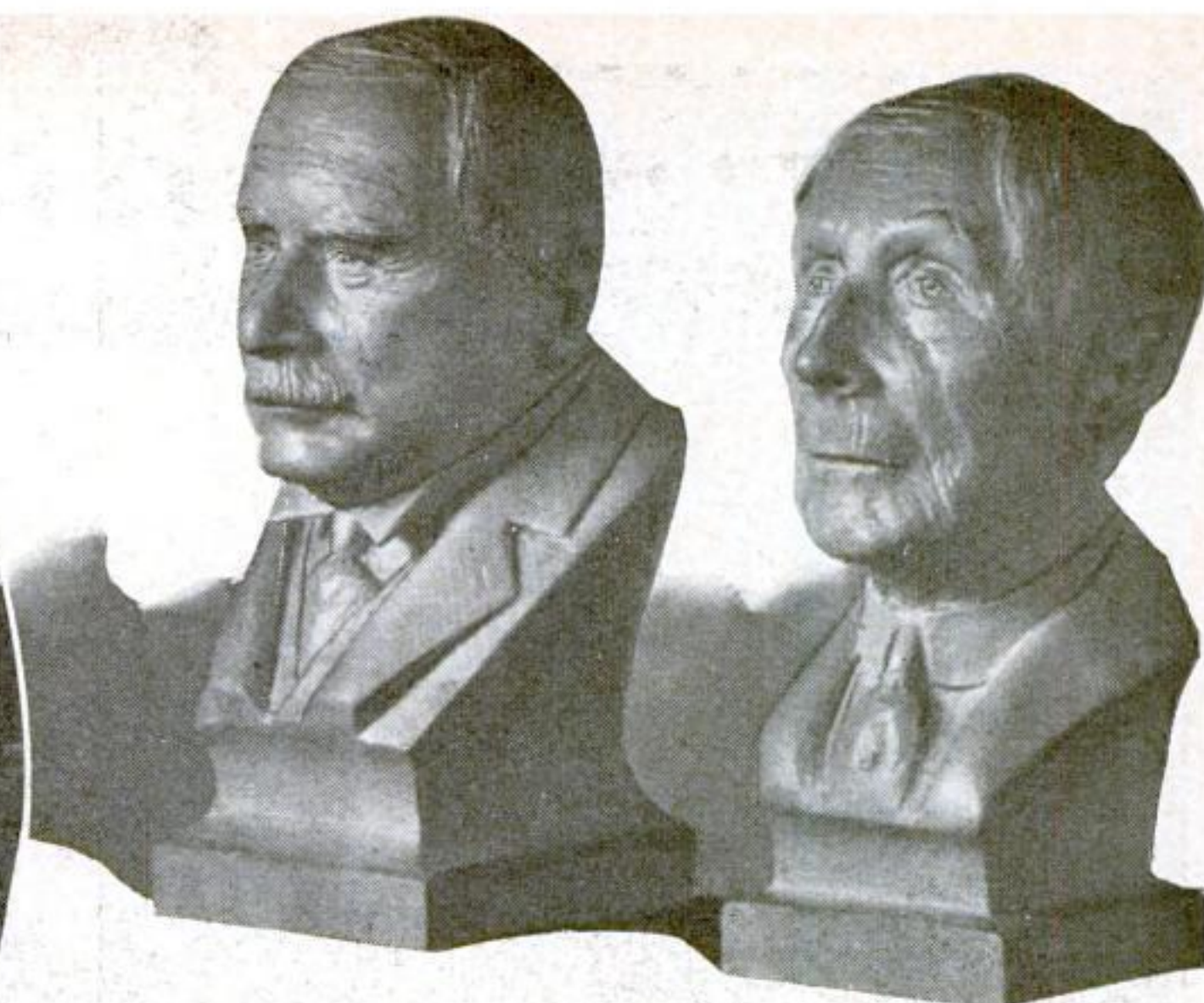
Eggs are weighed and separated as to sizes by this time-saving apparatus



New Checker Game Uses Pegs Instead of Men

PEGS of one color instead of the usual two-colored men add a new angle to the familiar game of checkers. The objects of the game are to remove all pegs by conventional jumping, and to manipulate them so that the last peg jumps into the center hole. The player making this last move wins the game. Either player is free to move any peg on the board one hole at a time.





Tiny busts of J. P. Morgan and John D. Rockefeller, carved from wood by Edwin T. Howell. They are pictured almost actual size. At the left, Howell is seen pursuing his unusual hobby at home

Thumb-Size Wood Carvings

... HOBBYIST'S SCULPTURES BRING \$500 A PIECE

WITH homemade tools fashioned from the wire of a discarded steel cable, Edwin T. Howell, of West Hempstead, N. Y., has resurrected a neglected art of the sixteenth century. He is sculpturing, from wood, miniature heads and figures of such remarkable fidelity that patrons pay as much as \$500 for one of the tiny busts, barely two inches high!

Into such pieces of work, however, go weeks and months of labor. It took Howell nearly three months to finish a miniature head of J. P. Morgan and almost two months to complete one of the late John D. Rockefeller, four reproductions of which were purchased by the Rockefeller family. Howell works either from photographs or from living models. Oftentimes, he pre-

pares a clay head as a guide before beginning the delicate task of carving.

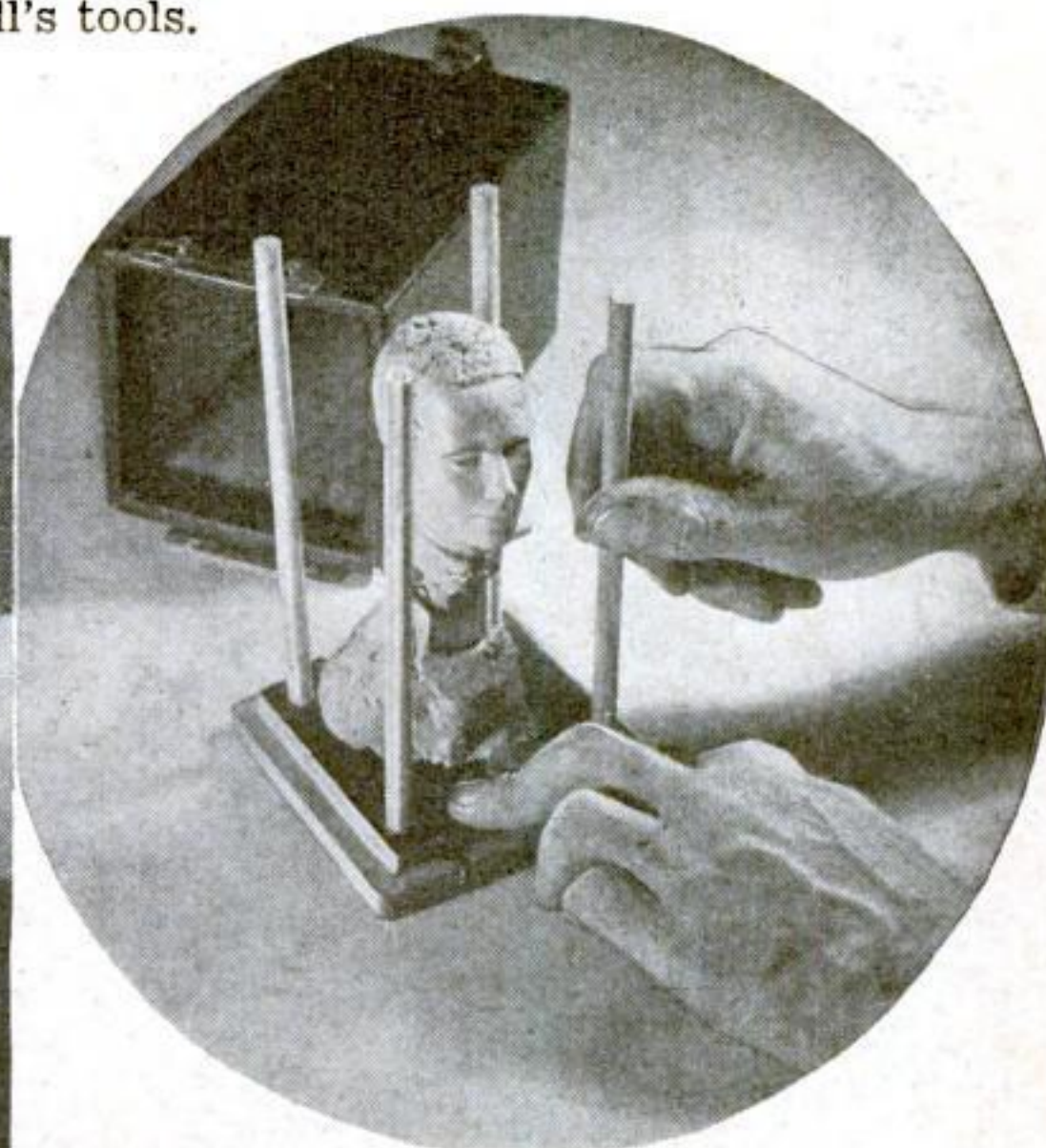
Turkish and West Indian boxwood furnish the material for the carvings. This wood is almost as hard as ivory, pale yellow with a luster suggesting Chinese glaze. Howell buys it in the form of logs and saws it up into small blocks. Occasionally, he discovers a knot inside a block after he has started carving. In such a case, there is nothing to do except to give up and start on another block.

All the tools that Howell uses are produced in his basement workshop. After experimenting with different kinds of steel, he found that best results came from the use of bits of wire taken from a piece of steel cable which he picked up in a vacant lot, some years ago. It had been discarded by telephone linemen when they finished bracing a new pole. This five-foot piece of cable has provided the metal for all of Howell's tools.

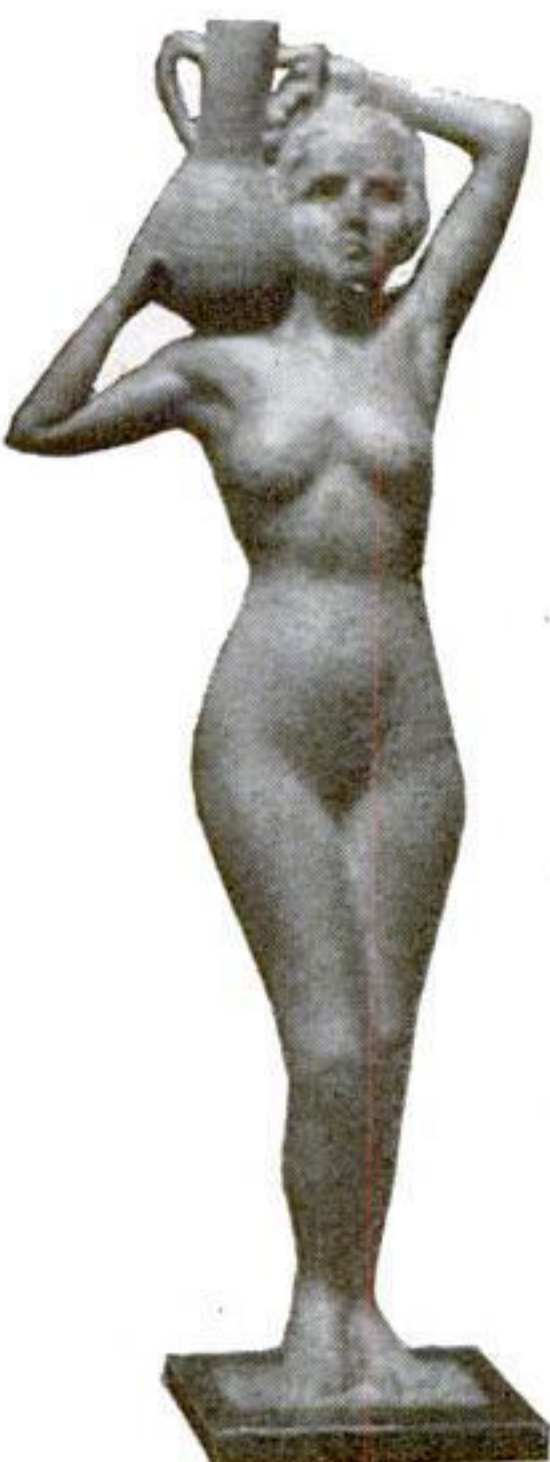


Hardly more than an inch high, this head was produced to order and brought the carver a \$500 fee

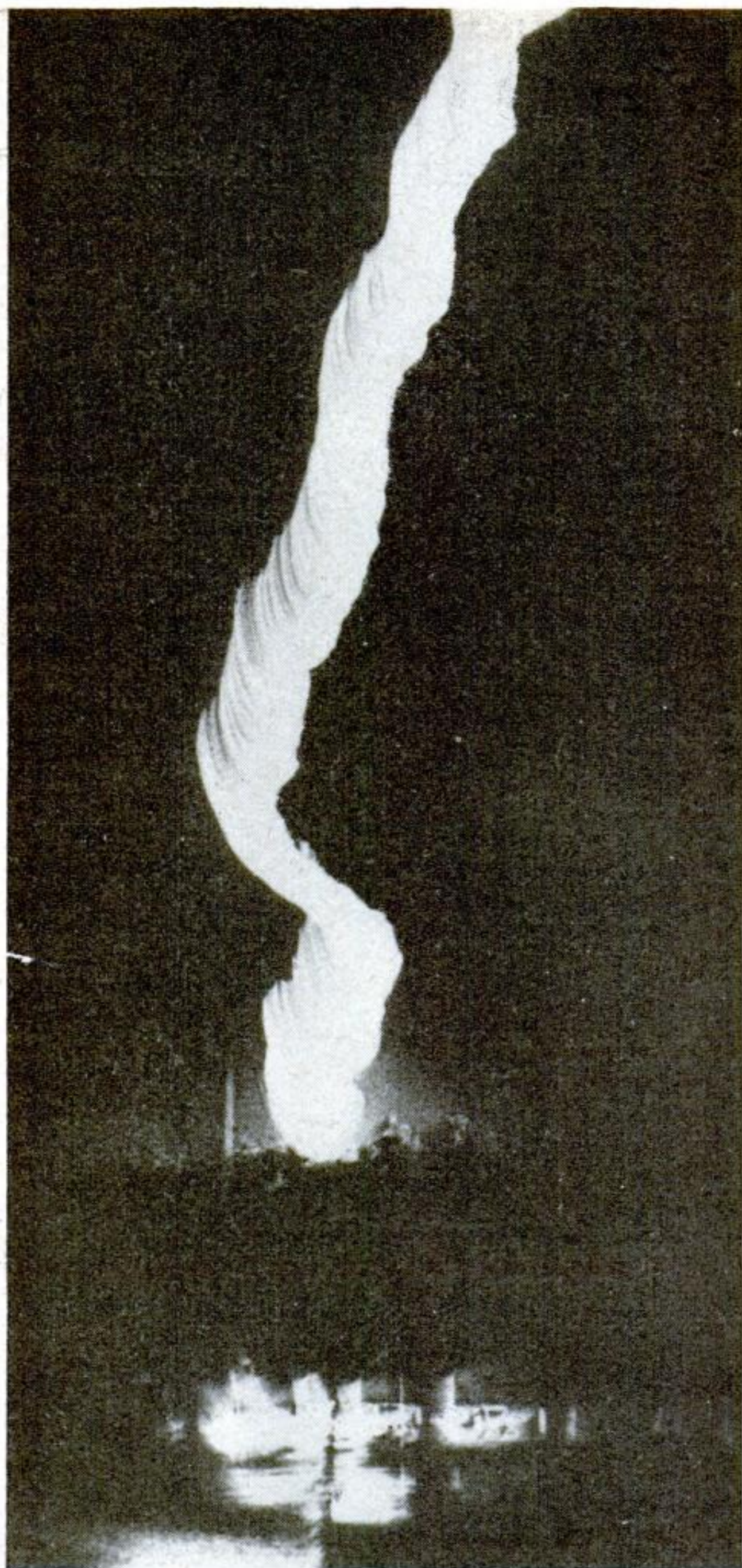
Below is a close-up of Howell's hands at work. His tools are all homemade and are fashioned from a length of discarded telephone-pole cable



A clay model being placed in a carrying case to be submitted for approval before the wood carving is begun. Posts guard the tiny figure



This artistic figure shows great realism



Photograph Shows Odd Flash

RESEMBLING a giant bed sheet twisted into rope, the queer lightning flash pictured above was snapped recently by an amateur photographer at Lake Maggiore, Switzerland. Lightning of this type is rarely seen, and is said never before to have been photographed. Experts say the flash resulted from the igniting of some inflammable compound in the air.

Baby's-Bottle Service Helps Mothers

Individual bottles are filled with a baby's own formula



MOTHERS are relieved of many chores in caring for their infants by a new baby service started in Washington, D. C. In addition to preparing and delivering an infant's daily milk formula, the unique service will furnish boiled drinking water, sterilized nipples, and other items. A staff of trained nurses is maintained, and a mother can call for a competent person to watch baby while she is out.



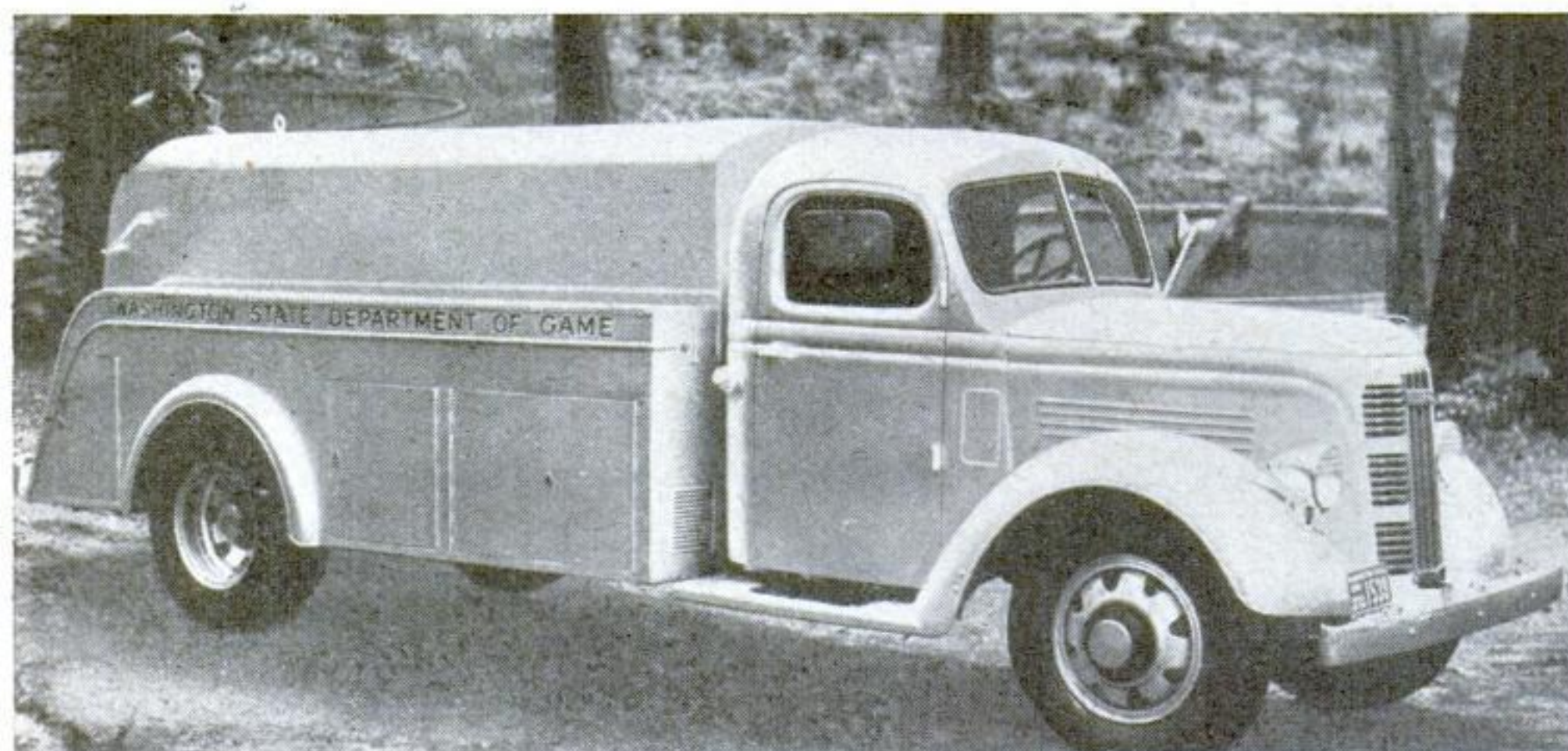
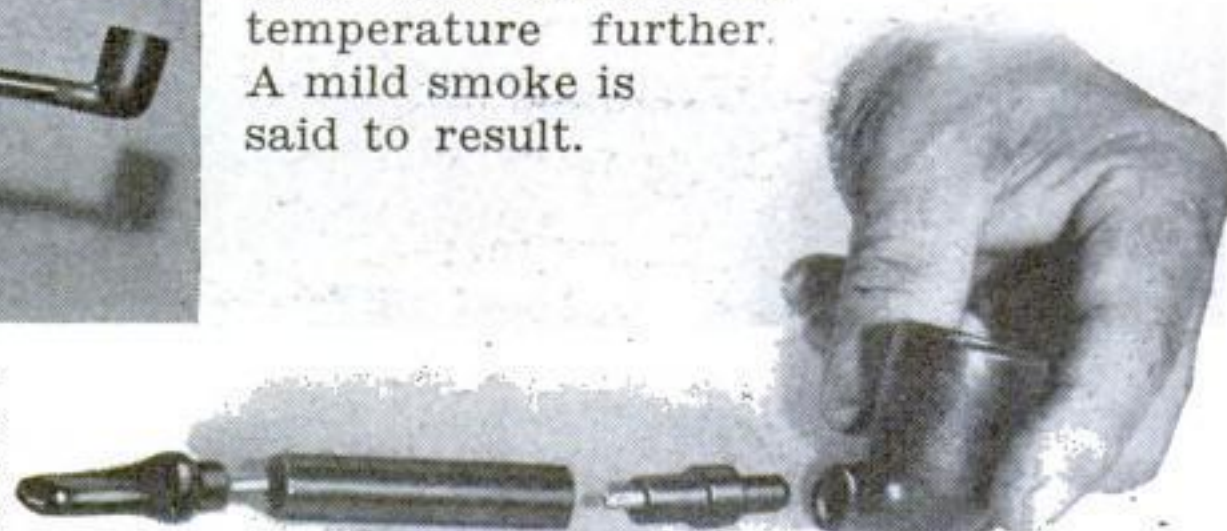
Nurses wrapping a day's supply of bottles for delivery to a customer

Air-Conditioned Pipe Gives Cool Smoke



The stem of the conventional-appearing pipe has an air-conditioning section, shown at right

AN AIR-CONDITIONED pipe is a recent invention for smokers. An elongated stem traps and cools the smoke, while the bit has a tiny hole bored into it so that air is drawn into the mouth with the smoke to lower its temperature further. A mild smoke is said to result.



More than 12,000 small fish can be transported in this ingenious water-conditioned tank truck

Tank Truck Transports Live Fish to Lakes

TO FACILITATE stocking operations, fish are speeded from hatcheries and rearing ponds to streams and lakes in a water-conditioned truck designed by B. T. McCauley, director of the Washington State Game Department. When the mobile fish tank reaches its destination, auxiliary motors circulate water through heating or cooling coils to regulate the temperature of the water in the tank to that of the lake or stream into which the fish will be released.

Giant Ocean Airliner Carries 64 Passengers

The double-deck cabin of this mammoth plane contains a lounge room, dining saloon, and game room, in addition to sleeping quarters



DESIGNED for transatlantic passenger service, the giant airliner pictured in the cutaway drawing and now under construction is rated at more than twice the tonnage of the clipper ships now flying a regular route across the Pacific. Plans for the sixty-four-passenger ship call for a double-deck cabin with a lounge room, dining quarters, and a game room, in addition to a regular passenger compartment. Non-stop flights of the huge craft from the United States to Europe will be flown at an altitude of 25,000 feet.

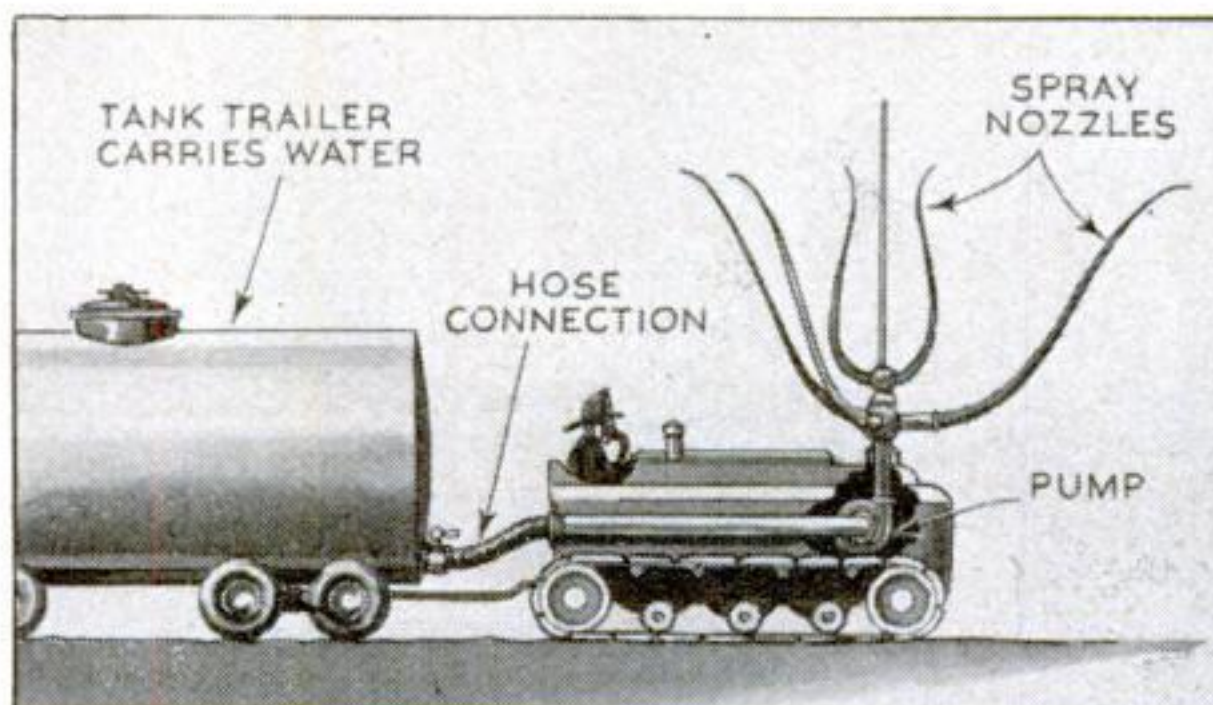
New Air-Conditioning Unit Keeps Circus Tents Cool

AIR CONDITIONING may be a feature of circuses when they take to the road next spring, according to the makers of a new portable cooling plant for tents. Capable of cooling an arena seating 350 people, each unit uses 200 pounds of ice in a day and is powered by electric motors connected to the circus lighting system.

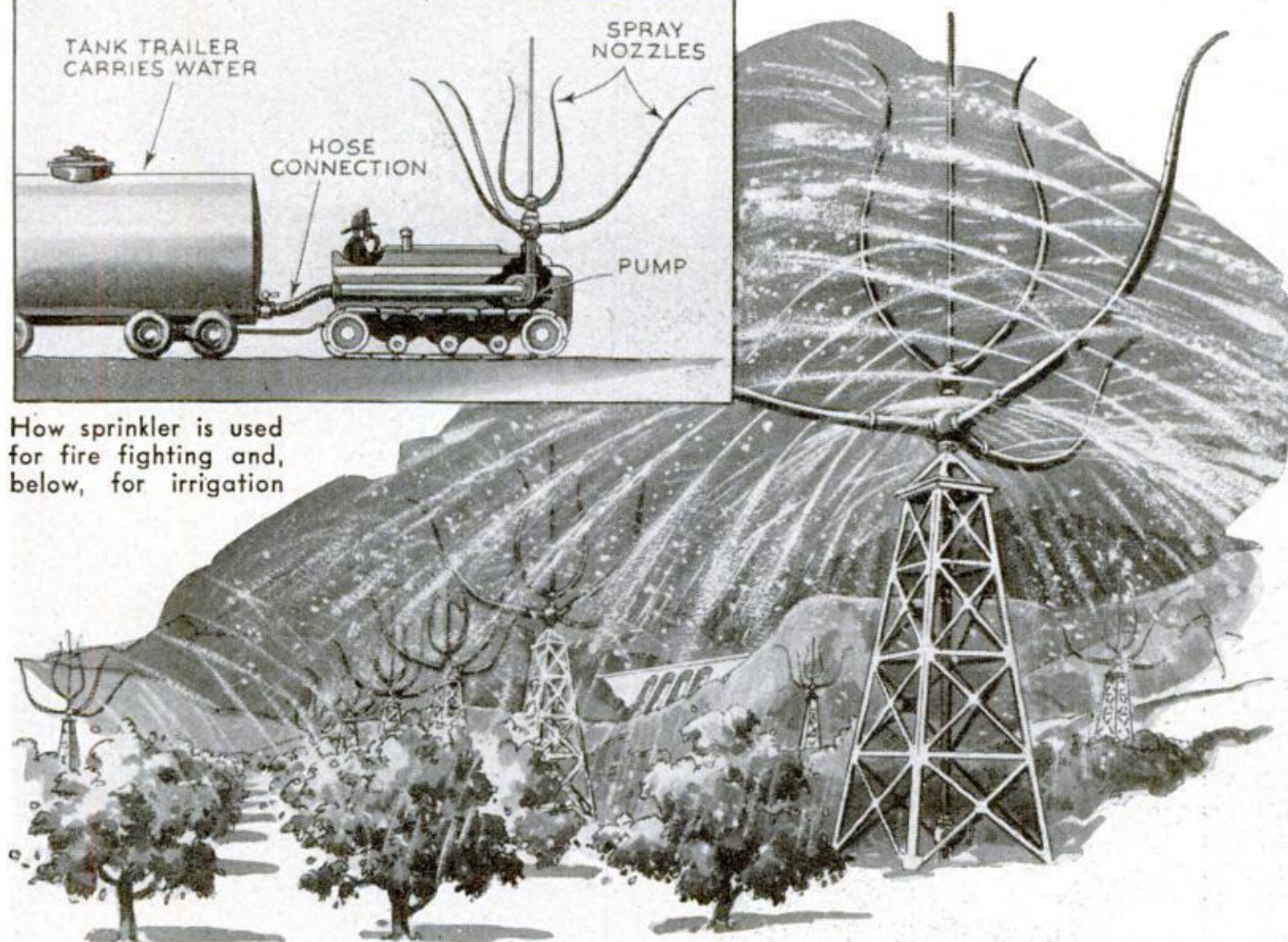


Portable unit for cooling circus tents. It uses 200 pounds of ice in a day

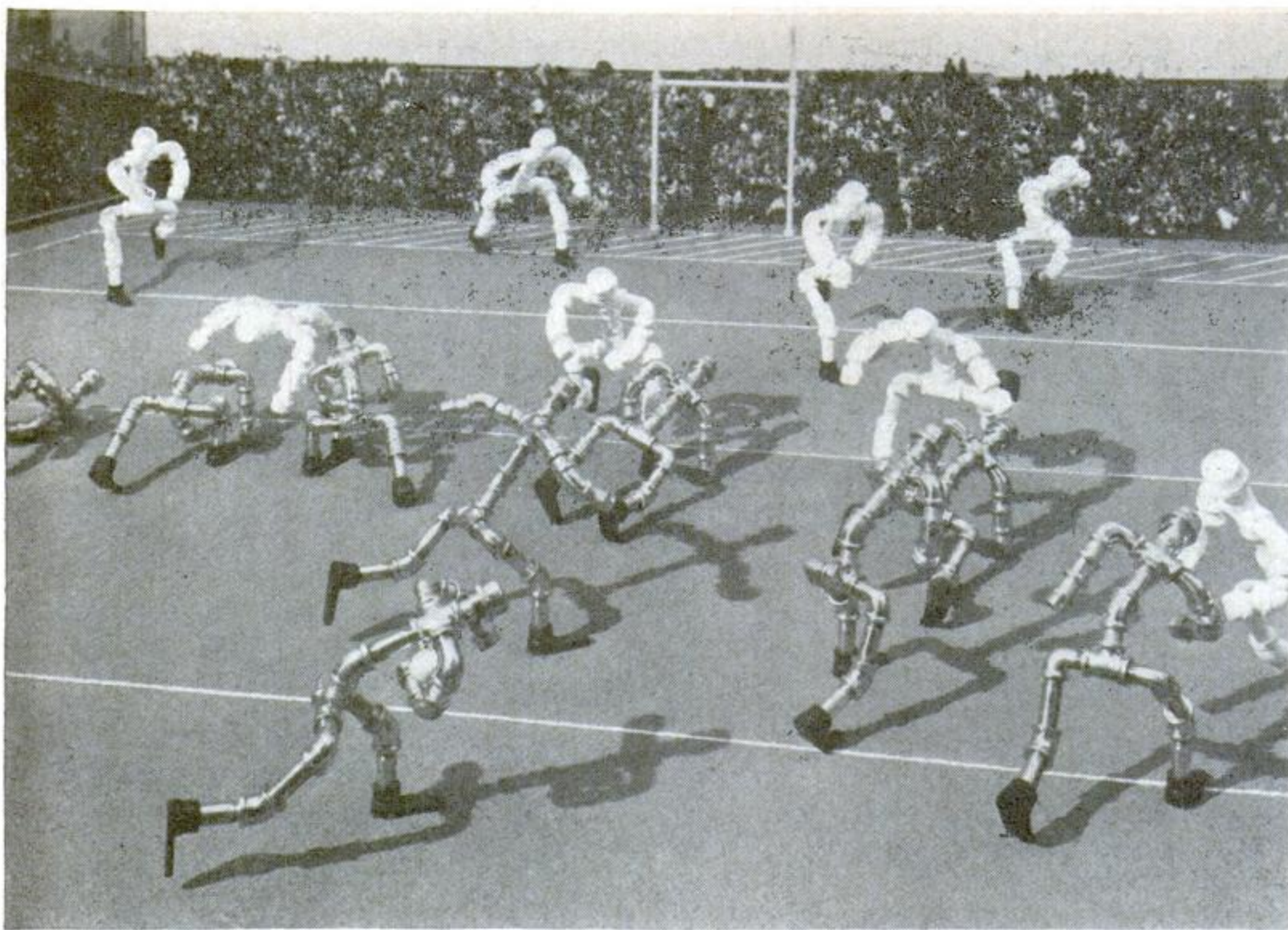
Octopus Sprinkler Fights Forest Fires and Drought



How sprinkler is used for fire fighting and, below, for irrigation



PERFORATED tentacles connected to a central supply pipe spray water over a wide area, in a novel sprinkler devised by Lucian Mantell of New York City. According to the inventor's present plans, the odd unit will serve a dual role as a fire-fighting and an irrigation device. For fighting fires, the unusual sprinkler will be mounted on the front of a tractor. Driven along the edge of a raging forest fire, it will quickly stem the advance of the blaze, water being supplied by a tank trailer or by a tank in the tractor itself. For irrigation work, a number of sprinklers will be erected on tall steel towers spaced at regular intervals through crop fields and connected by a series of underground pipes to a water reservoir. The drawing reproduced at the left pictures a sprinkler installation set up in a large orchard.



Odd Figures Made of Pipe Fittings

BRASS elbows, lugs, bushings, caps, and other pipe fittings were used to fashion the odd football players shown in the photograph at the left. Designed and constructed by two former football stars, the strange figures are arranged in the form of two elevens in action on the gridiron. Photographic reproductions of crowded stands add interest to the unusual display, now being exhibited.

These lifelike football players are composed of pipe joints and fittings. The stands are photographs

Large Planes Get Three-Wheeled Landing Gear

TRICYCLE landing gear, used on many of the new, low-cost, midget planes, is now being applied to conventional, full-size ships. Providing better visibility on landings and take-offs and eliminating the danger of ground loops, the three-wheeled construction does away with the tail skid and allows the plane to take off at flying level. When maneuvering on the ground, the front wheel pivots for making turns.

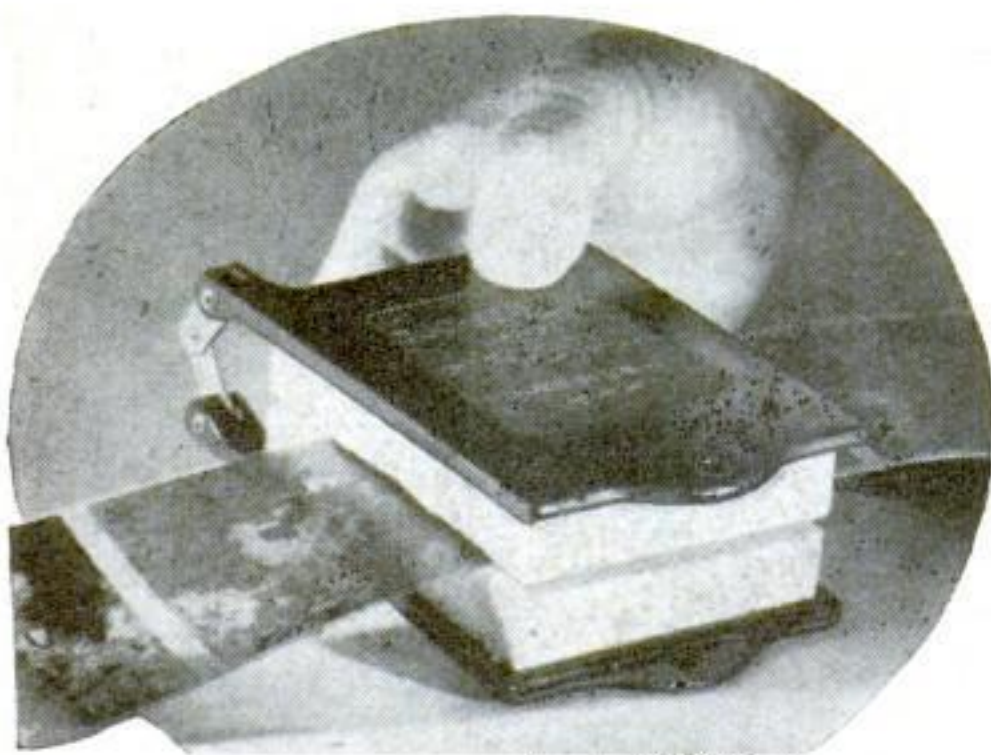


The pilot has an unobstructed view of the ground while taxiing



Light Ash Tray Fits on Cigarette Holder

ASHES cannot spill from a cigarette in a holder fitted with the novel ash receiver shown above. Made of aluminum, the lightweight receptacle is suspended from the holder by a clamp.



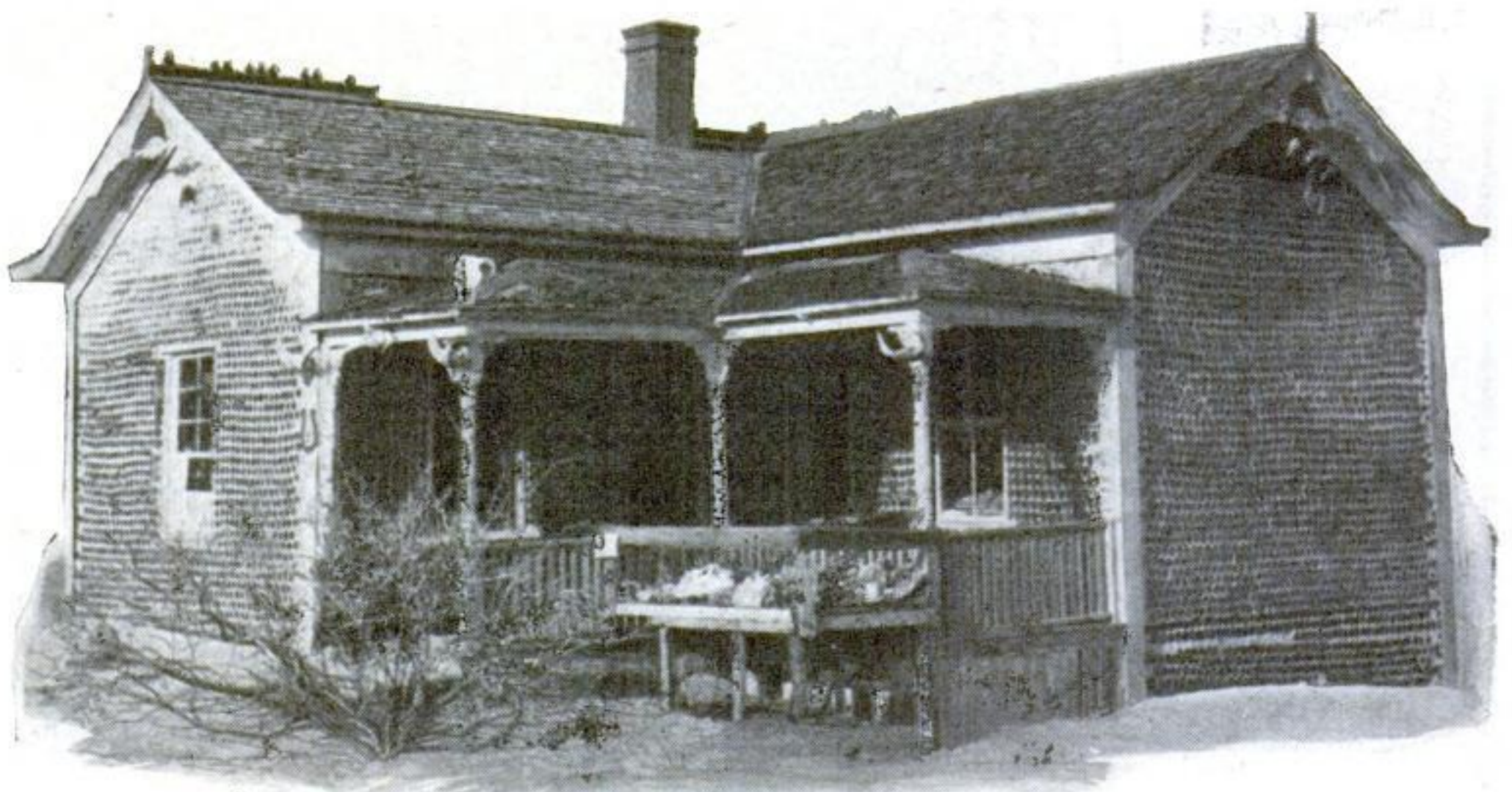
New Sponge Pack Dries Photograph Negatives

AMATEUR photographers can quickly remove excess moisture or developing solution from wet negatives with a sponge drier just introduced. Hinged molded plates holding two cellulose sponges are closed over one end of the film and pressed tightly together. The sponges absorb moisture as the film is pulled through the device, materially speeding up the negative-drying process.

Bottles Form Walls of Ghost-Town House

EMPTY bottles form the walls of an old house in the abandoned mining town of Ryolite, Nev. Laid in mortar with their bottoms to the outside, the

bottles have taken on an iridescent purplish hue owing to the action of the strong desert sun. This is the only building still intact in the town.

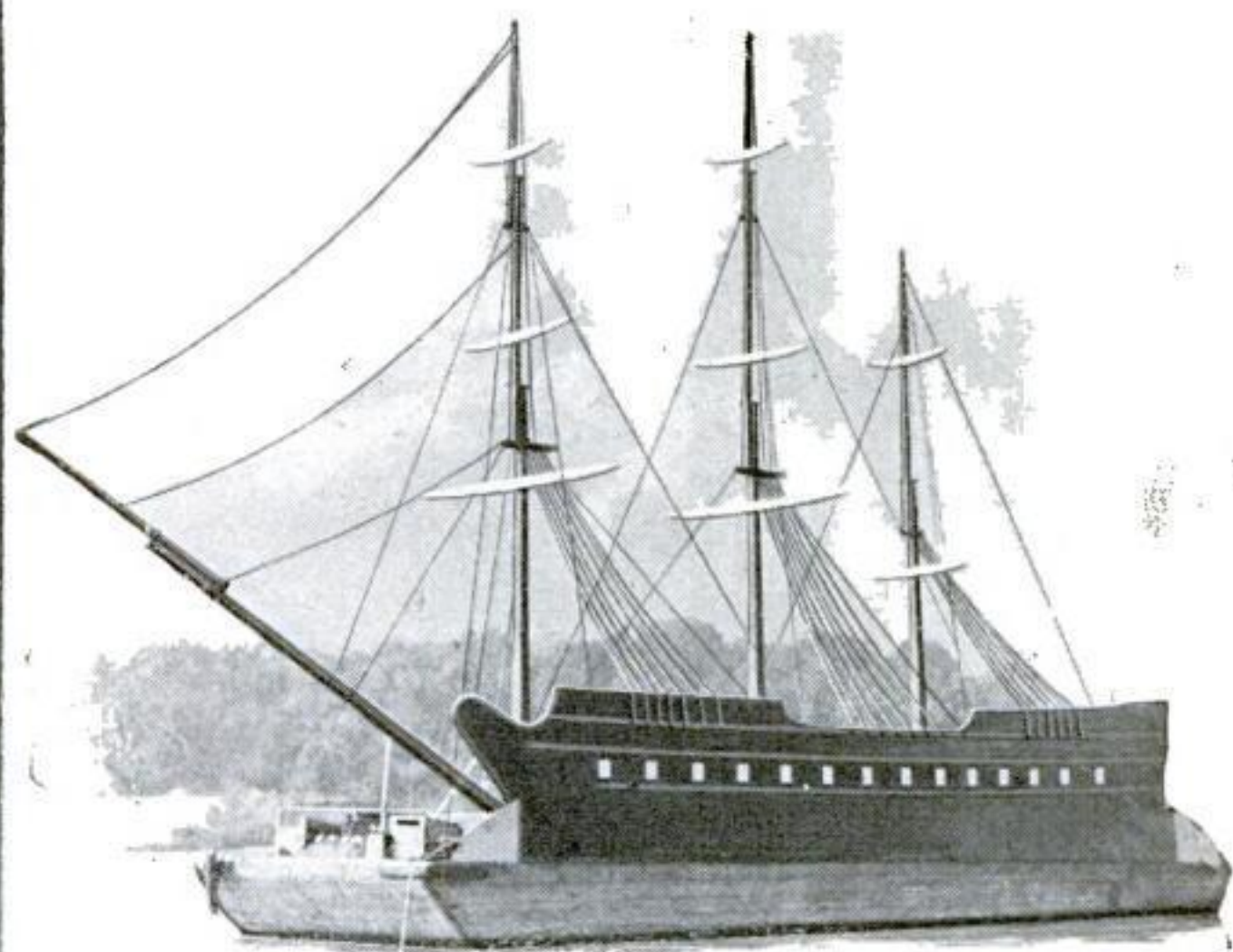


Bottles, laid in mortar with their bottom ends out, replace bricks in this queer house



Dummy Ships Reënact Famous Sea Fight

SKELETON replicas of two eighteenth-century warships were mounted on barges for a colorful reënactment of a famous naval engagement of the American Revolution. Features of a recent regatta near Washington, D. C., the dummy ships represented the *Bonhomme Richard*, flagship of John Paul Jones, and the *Serapis*, British man-of-war which it defeated in a desperate battle off the coast of England 158 years ago.



Mounted on a barge, this skeleton man-of-war took part in the mimic Revolutionary naval battle pictured at the left

Reid C. Springer exhibiting a cross section of his new oval steel piling

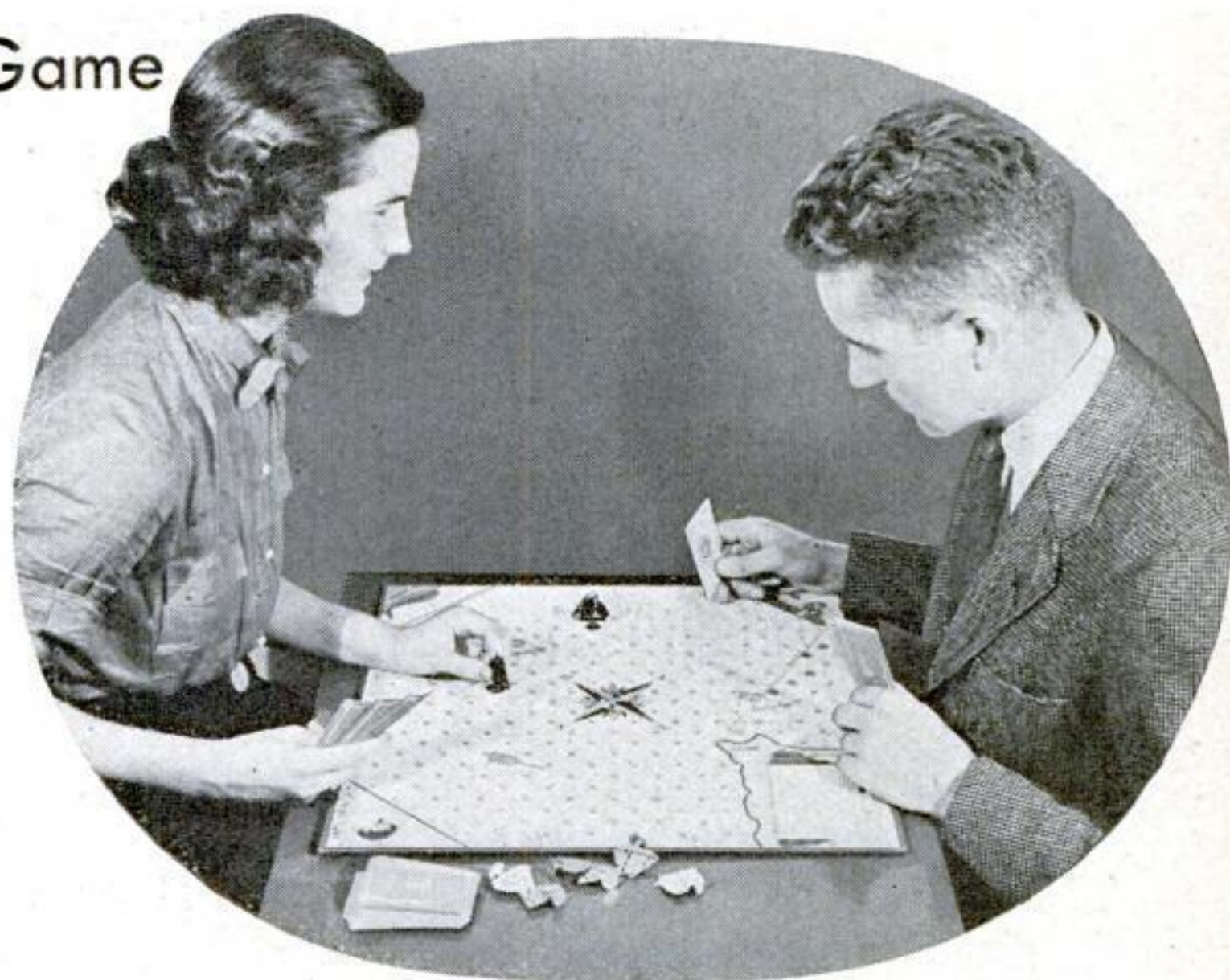


Odd Oval Steel Piling Shows Great Strength

WITH an oval cross section, and a curved fin jutting out from each side, a new form of steel piling is said to withstand more than three times as much pressure as standard H steel piling. Its shape and the hollow center make it easier to drive, while the projecting fins add stability and prevent turning.

New Card Game Simulates Boat Race

DIMINUTIVE sailboat models are moved along a triangular sailing course marked off on a board, in a novel game just introduced. Moves are made according to playing cards which are drawn and discarded. Following his cards, a player sets his course, tacks, comes about, and performs various other moves to bring his boat in ahead.



Players move toy ships on a board according to the cards they turn

TESTS OF SCIENTIFIC LAWS

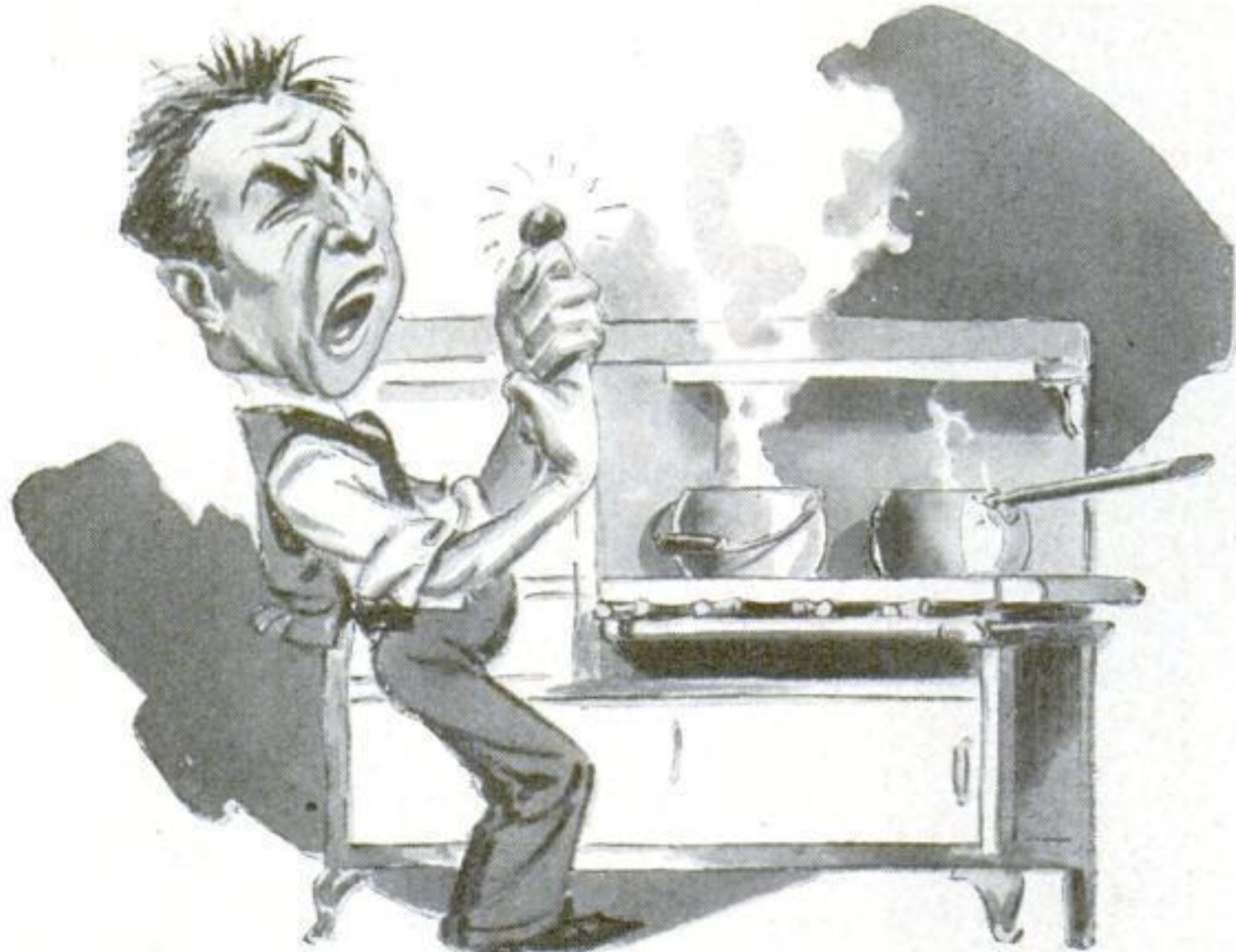
● Have you ever wondered why a yellow or amber headlight on a car cuts through fog or mist, while a white headlight produces glare? You can see for yourself by performing an easy experiment described among the "Novel Tests of Scientific Laws" on page 102. This regular feature, along with the departments on microscopy, chemistry, and radio, is now found in our enlarged Home Workshop section, presenting an unequalled monthly manual of new ideas for the home mechanic and the amateur scientist.

POPULAR SCIENCE

Question Bee

How well do you know your way around the modern world of science and mechanics? Here's an entertaining test you'll enjoy trying. After each of the numbered questions below, you'll find just one correct answer. All the rest are

false—the Question Bee Editor made them up out of whole cloth, just to fool you. Can you outwit him and pick the right one? Jot down whichever of the letters corresponds to your answer. Then turn to page 132 and see how you fared.



1 If two pots of water are boiling on the stove, one furiously and the other gently, (a) the first is the hotter (b) the second is the hotter (c) their temperature is just the same.

2 Madame Curie was the discoverer of (a) electricity (b) the Mississippi River (c) radium (d) vitamins.

3 To find out what a star is made of, you would use a (a) telescope (b) spectroscope (c) gyroscope (d) kaleidoscope.

4 Dr. William Beebe observes undersea life from a globe-shaped diving bell called a (a) hemisphere (b) bathysphere (c) stratosphere.

5 The centigrade scale is (a) an insect that attacks citrus orchards (b) a device to weigh loaded freight cars (c) a system of numbering thermometers (d) a striped stick that surveyors use.

6 Sir Charles Parsons's invention of the steam turbine revolutionized travel by (a) airplanes (b) ocean liners (c) trains (d) rockets.

7 A mortise and tenon are (a) a receptacle and crushing implement used for grinding up chemicals (b) a socket cut in one board and the part of another board that is shaped to fit it, forming a joint used in woodworking (c) the words that lawyers use for a mortal wound and the instrument that caused it.

8 A storage battery has the important advantage over dry cells that (a) it will transmit electricity to greater distances (b) it holds an inexhaustible supply of electricity (c) it can be kept full of electricity by recharging it.

9 When you see a green roof of unpainted metal, you know that it is made of (a) tin (b) copper (c) iron (d) aluminum (e) stainless steel.

10 Angstrom units are (a) small air-conditioning plants (b) Diesel-power units for streamline trains (c) extremely small units of length for measuring light waves.

11 Yellow fever is transmitted by (a) cows (b) mosquitoes (c) mad dogs (d) humming birds.

12 A total eclipse of the sun occurs when the face of the sun is hidden by (a) extra-large sunspot (b) planet (c) Halley's comet (d) the moon.

13 The loudness of a sound is measured in (a) decibels (b) liters (c) parsecs (d) centimeters (e) amperes.

14 A Wheatstone bridge is (a) a dental fitting (b) an instrument for measuring electrical resistance (c) a rapidly erected type of pontoon bridge (d) the place from which commands are given while a large liner is docking.

15 The engine of an automobile is connected to the wheels through the (a) carburetor (b) clutch (c) fan belt (d) exhaust (e) brake.

16 Wind tunnels are used (a) to expose models of airplanes and other fast vehicles to a swift air current and study their behavior (b) to keep high winds from blowing trains off the track at mountain passes (c) to serve as air ducts for operating compressed-air tools.

17 Tin cans are made of (a) tin and lead (b) tin and copper (c) tin and iron (d) just tin.

18 The historic message flashed between Washington and Baltimore to open the world's first telegraph line was (a) "Eureka" (b) "What hath God wrought" (c) "Come here, Watson, I want you" (d) "Mary had a little lamb."

19 Steel parts of buildings and bridges are commonly fastened together with (a) nails (b) rope (c) rivets (d) glue (e) suction cups.

20 The Pleistocene age is (a) the age at which a person attains his full height and ceases to grow (b) a prophesied era when peace will rule the world (c) a prehistoric epoch when men shared the earth with mastodons, mammoths, and saber-toothed tigers.

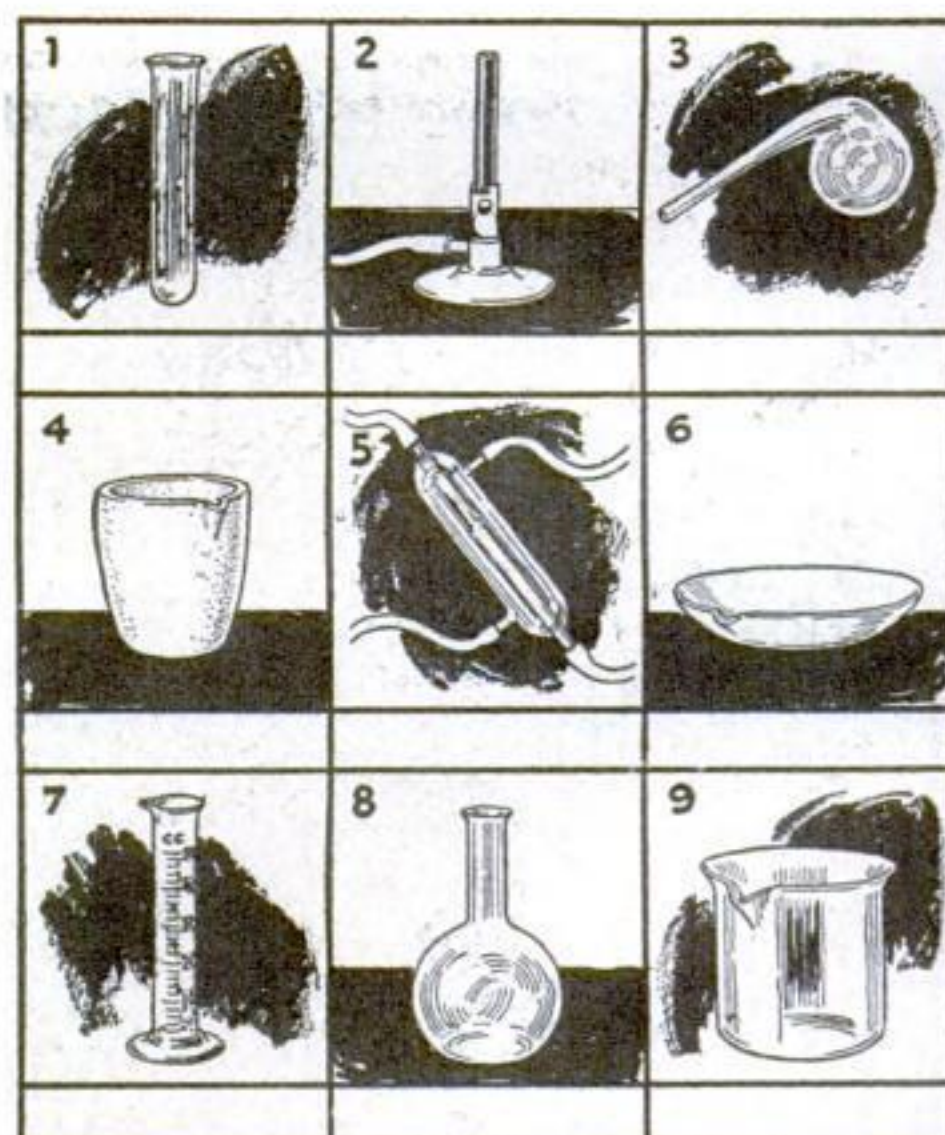
21 The name "neon" in neon signs stands for (a) the man who invented them (b) the company that makes them (c) the rare gas in them.

22 Liquid rises in a soda straw that you suck upon, because (a) science says it has to (b) this is a mysterious exception to the laws of gravity (c) the pressure of the air outside pushes the liquid up the straw.

23 To learn how people lived many centuries ago, you would consult (a) a physicist (b) an archaeologist (c) a phrenologist (d) a polygamist.

24 It's "petrol" in England, and "essence" in France, but we call it (a) ginger ale (b) attar of roses (c) carbolic acid (d) gasoline.

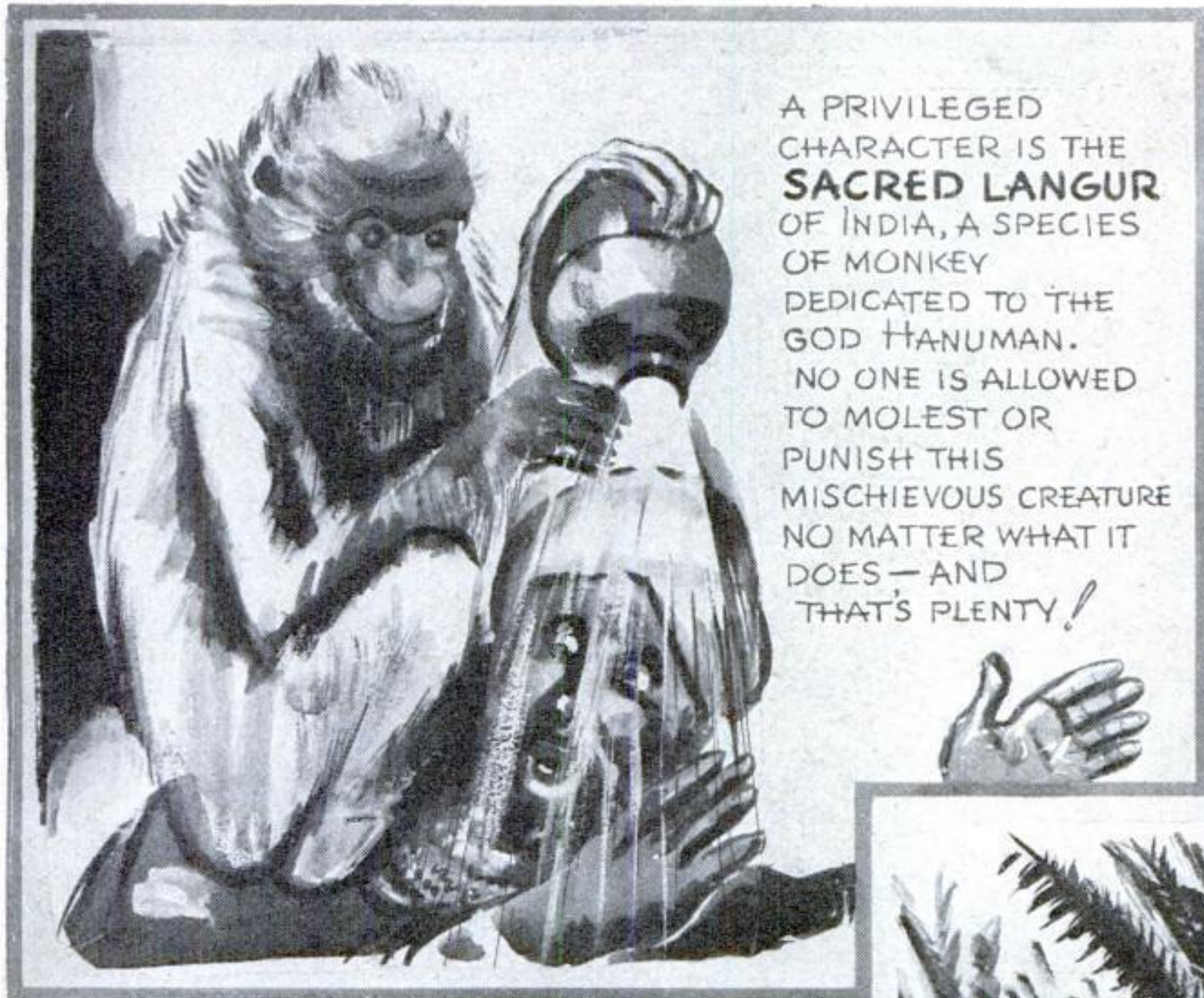
25 If you should encounter a giant panda, a good thing to do would be to (a) climb it and eat its fruit (b) borrow a miner's lamp and explore it, charting its faults and fissures (c) shoot it and bring it to a museum of natural history (d) collect carefully all arrowheads and pieces of pottery to be found in the vicinity (e) harpoon it.



Here are some articles that every chemist uses. Can you write the name of each under its picture? The names of all appear in the following list:

beaker evaporating dish flask
Bunsen burner retort test tube
condenser graduate crucible

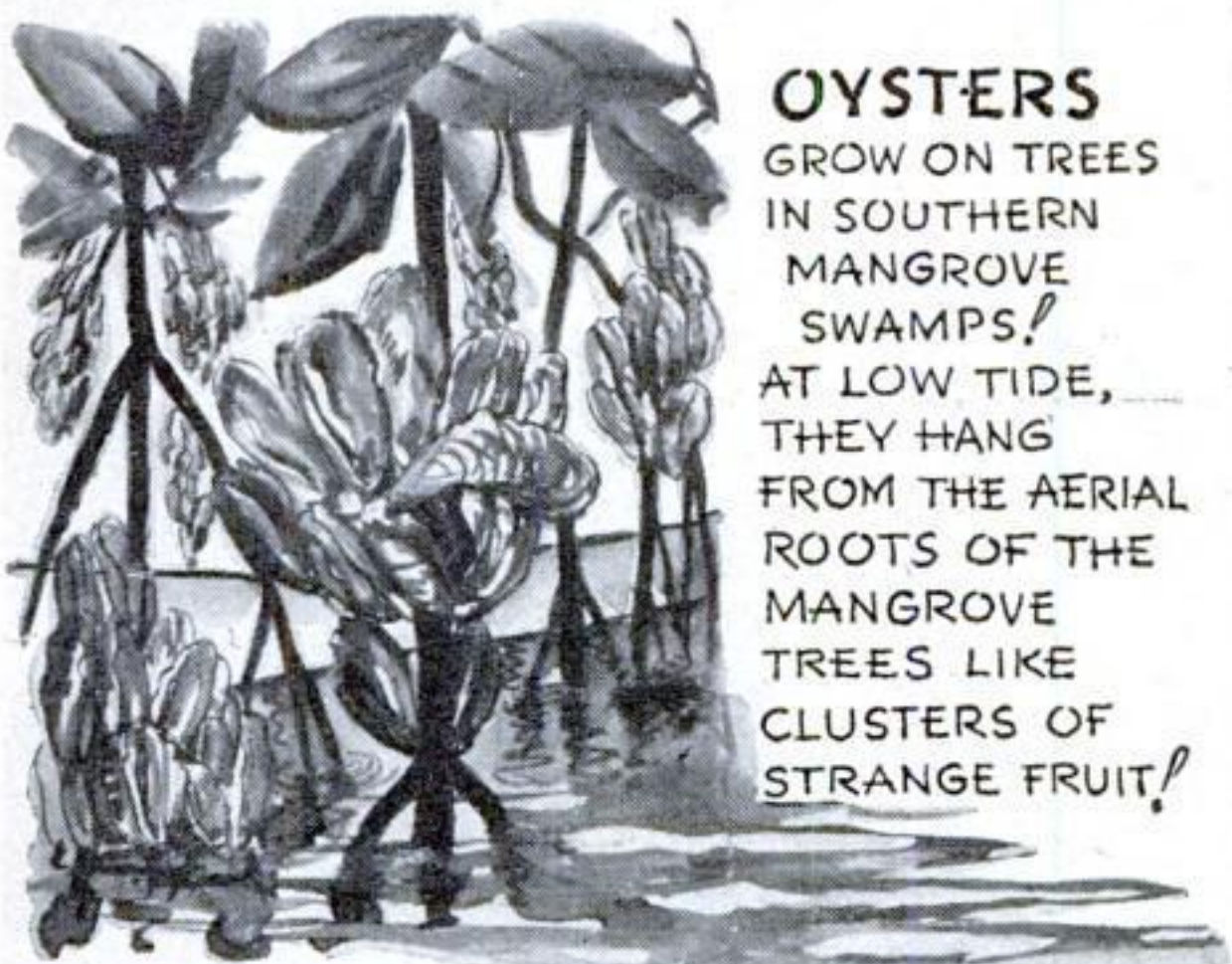
Un-Natural History By GUS MAGER



A PRIVILEGED CHARACTER IS THE **SACRED LANGUR** OF INDIA, A SPECIES OF MONKEY DEDICATED TO THE GOD HANUMAN. NO ONE IS ALLOWED TO MOLEST OR PUNISH THIS MISCHIEVOUS CREATURE NO MATTER WHAT IT DOES—AND THAT'S PLENTY!



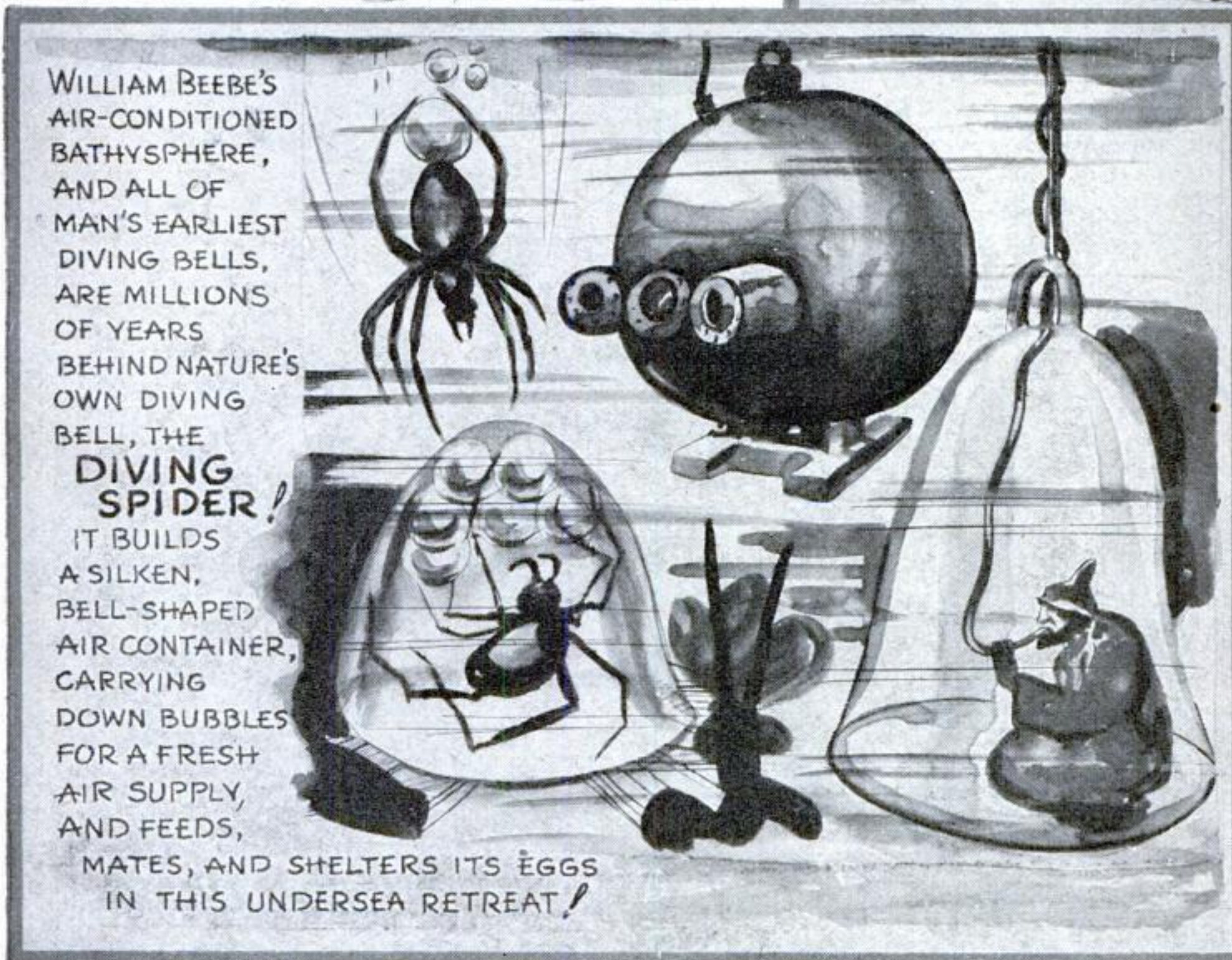
THIS FREAK GOOSE IS THE **CHAJA**, OR SCREAMER, OF THE SOUTH AMERICAN PAMPAS. IT HAS THE HEAD OF A CHICKEN, WITH A COUPLE OF INDIAN FEATHERS STUCK IN THE BACK OF ITS HEAD, A DOUBLE RING AROUND ITS NECK, AND A SORT OF BEARD!



OYSTERS GROW ON TREES IN SOUTHERN MANGROVE SWAMPS! AT LOW TIDE, THEY HANG FROM THE AERIAL ROOTS OF THE MANGROVE TREES LIKE CLUSTERS OF STRANGE FRUIT!



BECAUSE AUSTRALIA HAS BEEN CUT OFF FROM THE REST OF THE WORLD FOR MILLIONS OF YEARS, IT HAS TYPES OF PLANTS AND ANIMALS THAT HAVE BEEN EXTINCT ELSEWHERE SINCE BEFORE THE AGE OF MAMMALS. **GIANT TREE FERNS**, FOUND ONLY AS FOSSILS IN OTHER PARTS OF THE WORLD FLOURISH ON THE ANTIPODEAN CONTINENT!



WILLIAM BEEBE'S AIR-CONDITIONED BATHYSPHERE, AND ALL OF MAN'S EARLIEST DIVING BELLS, ARE MILLIONS OF YEARS BEHIND NATURE'S OWN DIVING BELL, THE **DIVING SPIDER**! IT BUILDS A SILKEN, BELL-SHAPED AIR CONTAINER, CARRYING DOWN BUBBLES FOR A FRESH AIR SUPPLY, AND FEEDS, MATES, AND SHELTERS ITS EGGS IN THIS UNDERSEA RETREAT!



THERE'S NOTHING STRANGE ABOUT AN EEL PREYING ON INSECTS, BUT WHEN AN INSECT BITES AN EEL, THAT'S NEWS! THE **WATER TIGER**, LARVA OF THE MEAT-EATING WATER-BEETLE, IS ABOUT THE MOST BLOODTHIRSTY OF ALL INSECTS, AND LIKES NOTHING BETTER THAN TO KILL AND DEVOUR A FISH OR AN EEL!

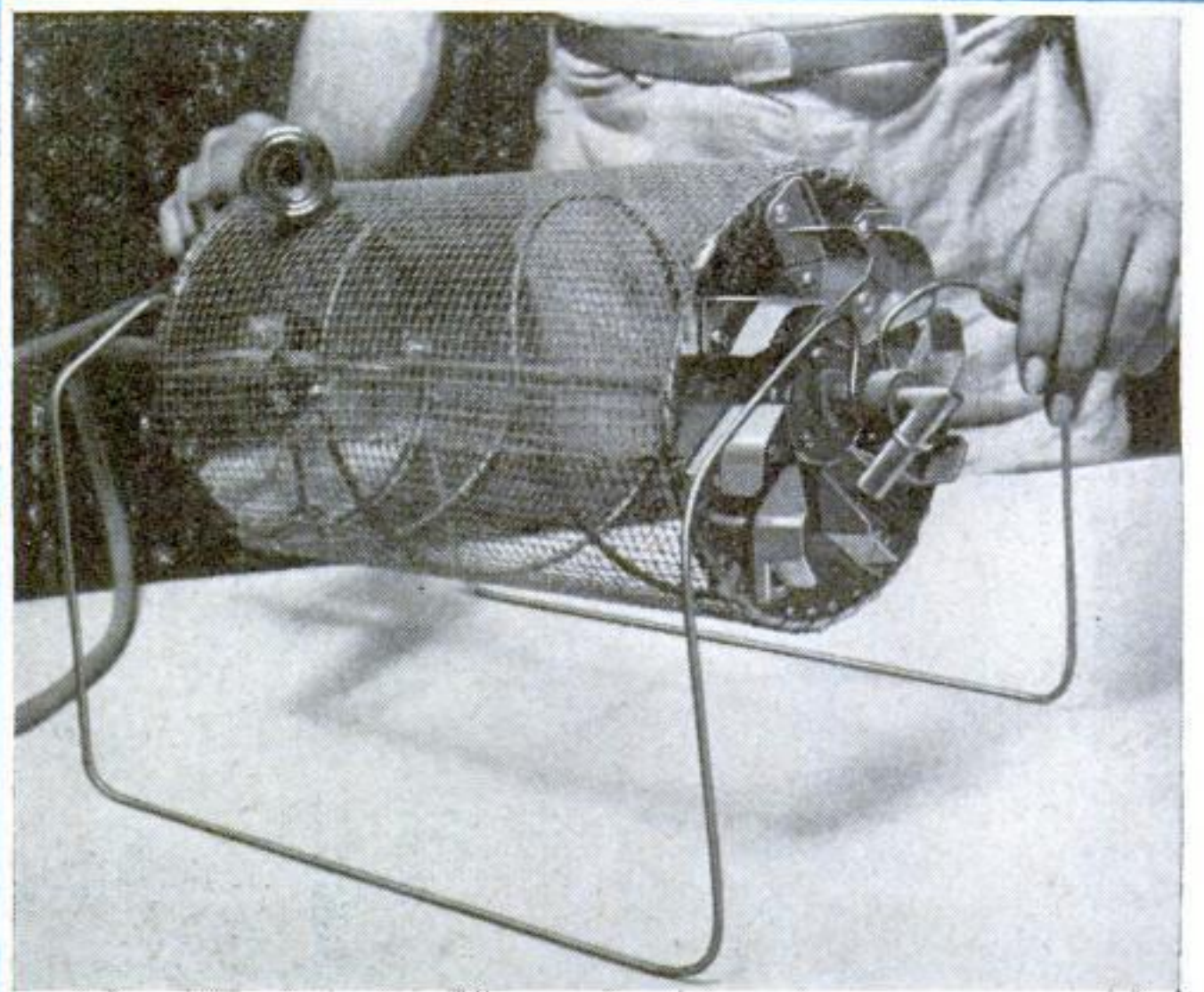
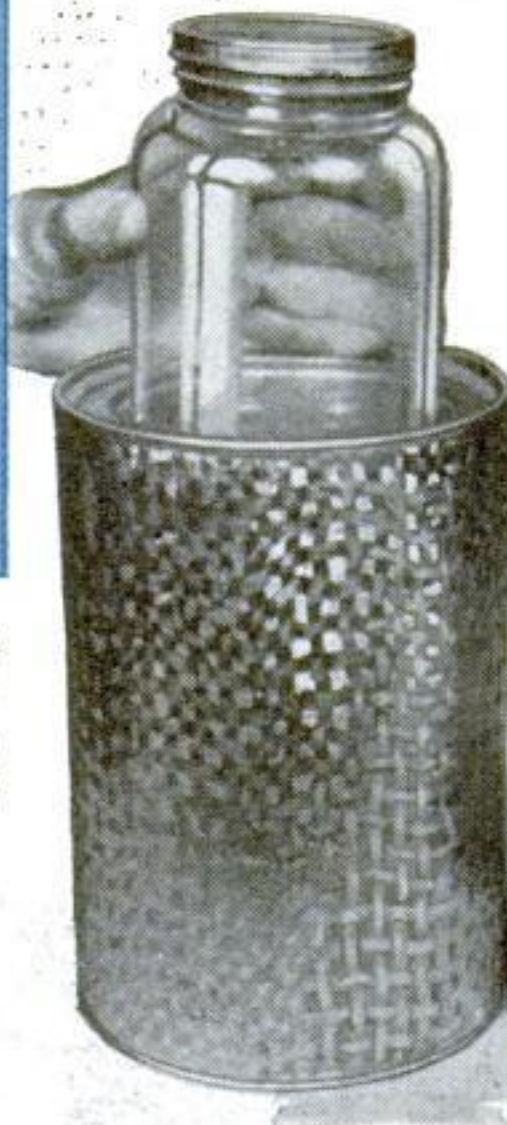
Latest Appliances



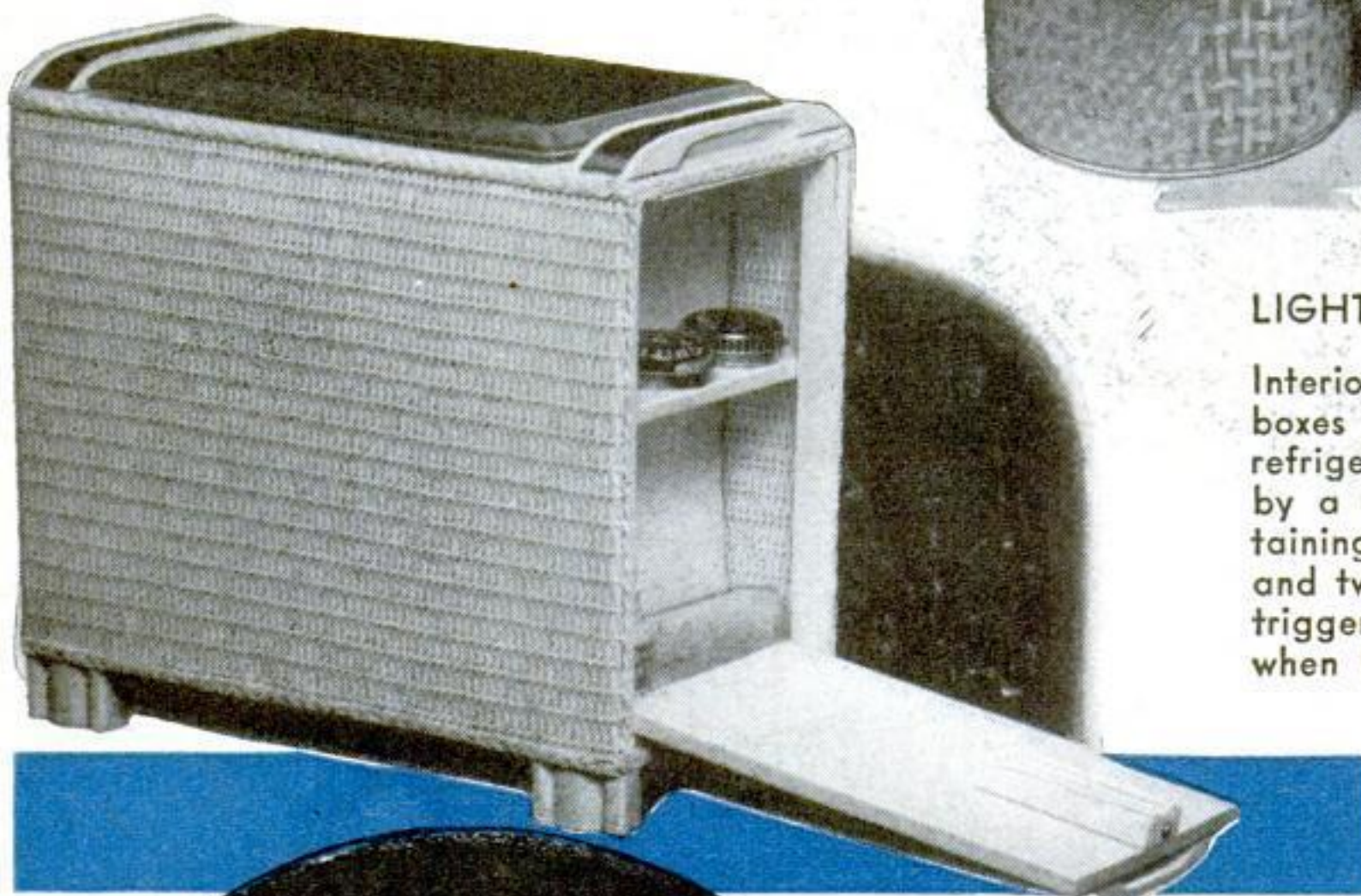
DUST CLOTH ON SPOOLS. With a new-type dust mop, a fresh cleaning surface can be exposed at any time by turning a spool that unrolls cloth from another spool on the other side of the mop

KEEPS JARS HOT OR COLD

When a quart-size glass fruit jar is placed in the container pictured below, its contents are kept hot or cold for hours. A heat-insulating material fills the container's jacket

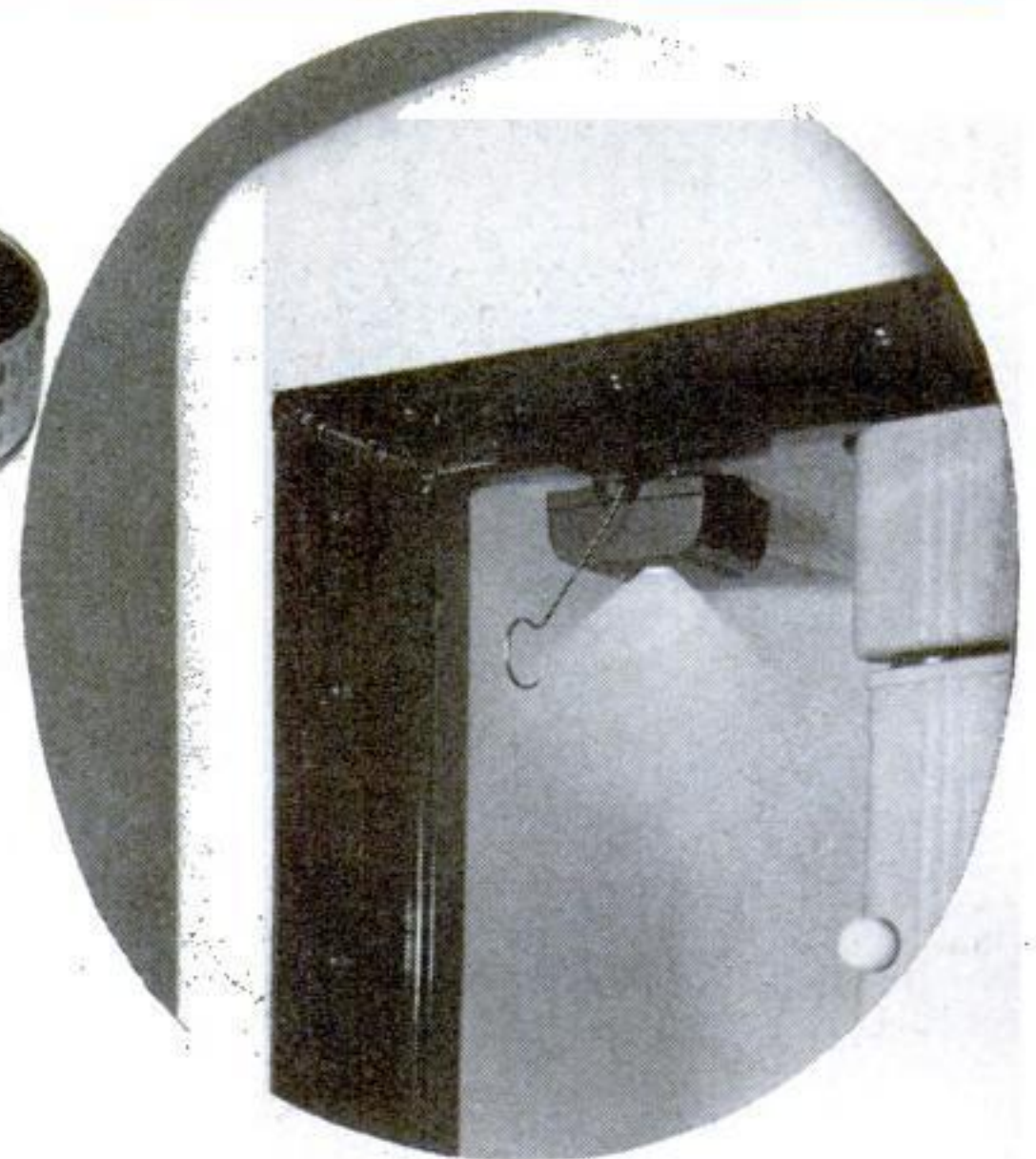


SPINACH WASHER. Tumbled over and over in the revolving cage of this odd device, spinach is washed thoroughly by a spray of water from holes in the central tube. The cage is turned by a stream playing on the curved fins seen at the end

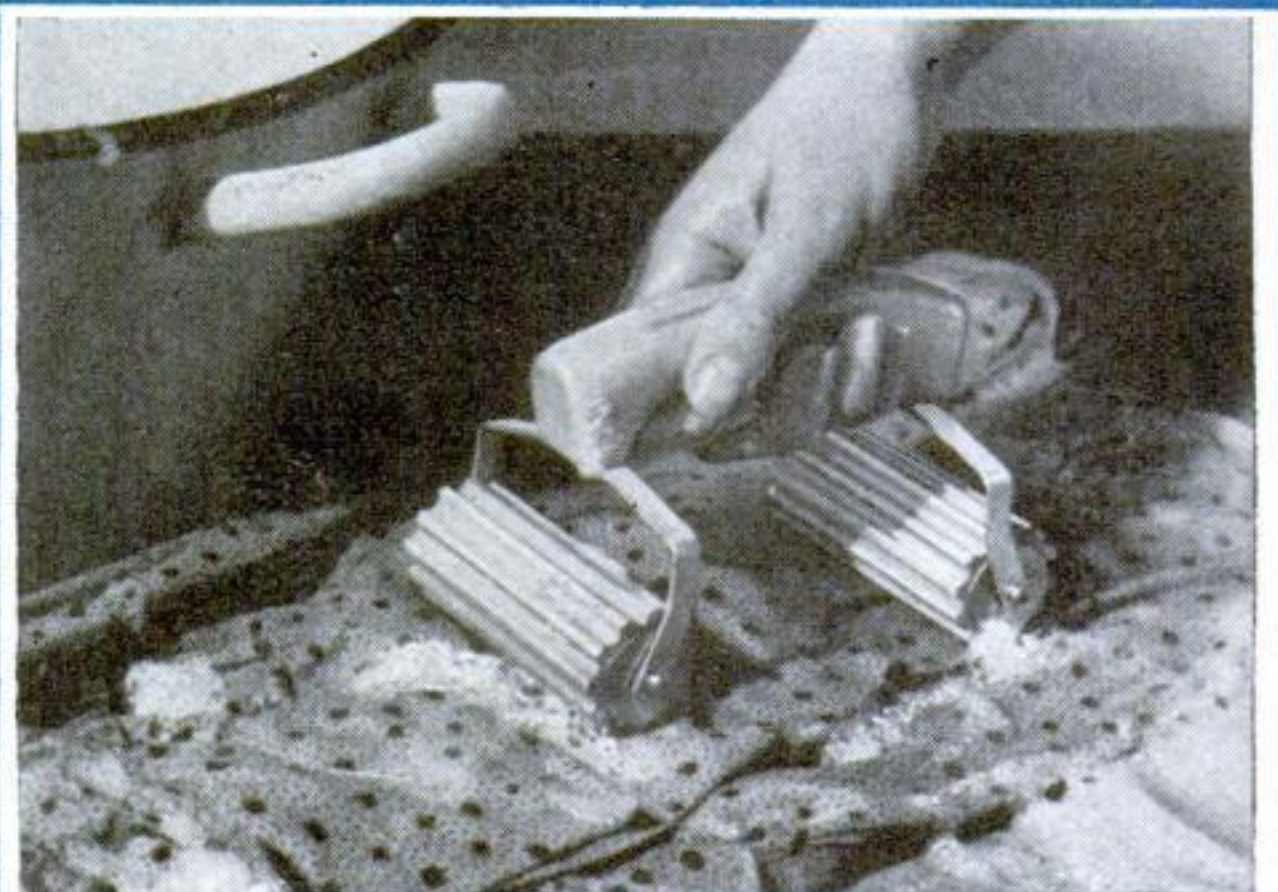


LIGHT FOR ICE BOX

Interior lighting for ice boxes and gas-operated refrigerators is provided by a compact unit containing a flash-light bulb and two dry cells. A wire trigger turns off the light when the door is closed



ROLLERS FOR WASHING. Dainty fabrics can be laundered safely with the device shown below. Rubber rollers, mounted in tandem on a convenient handle, are run over the soaked cloth spread on a drain board, to force in air and suck out the dirt



CABINET HAMPER

Here are two versatile laundry hampers. The one above has a concealed compartment for shoe-shining equipment, the hinged door forming a foot rest for polishing. At the left is a hamper with built-in utility shelves for storing various household supplies. Both have woven-fiber finish, with tops of a plastic material resembling mother-of-pearl



for the Household



BAG KEEPS LETTUCE FRESH

Lettuce and other salad greens are protected from wilting in this moistureproof bag. Before serving, the bag is hung over the sink and water drains out through an eyelet



KITCHEN TABLE SLIDES BACK INTO CABINET

When not in use, a new kitchen table slides back into a cabinet which also provides space for storing pots and pans. Telescoping side rails support the table when it is extended, and the folding leaves give as much working space as is desired. The cabinet has a rustless metal top, and three drawers to hold tableware

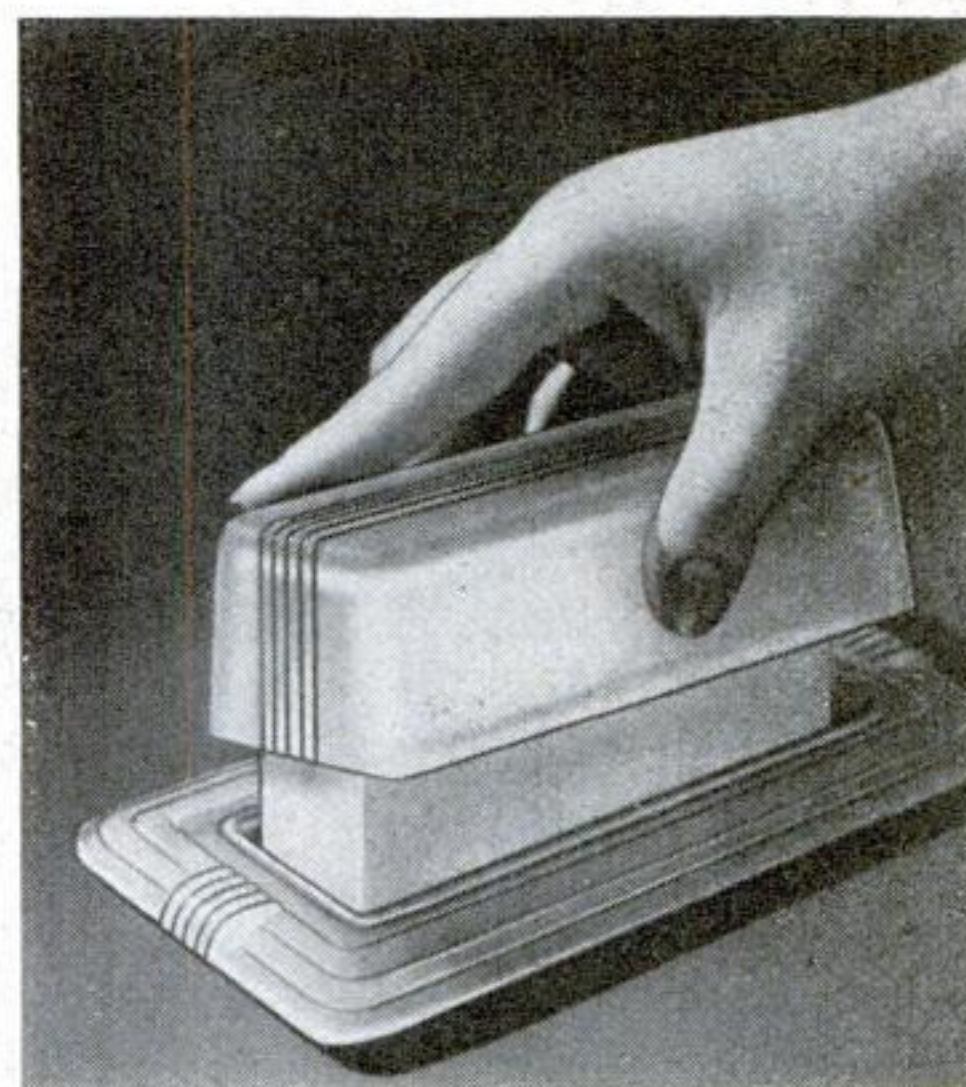
URNS COFFEEPOT INTO TEAPOT

Glass coffeepots can be used for making tea by the addition of a handy serving top. Fitting into the neck of the flask, and held in place by spring clips, the compact device includes perforations for straining out the leaves and a spout for pouring the beverage

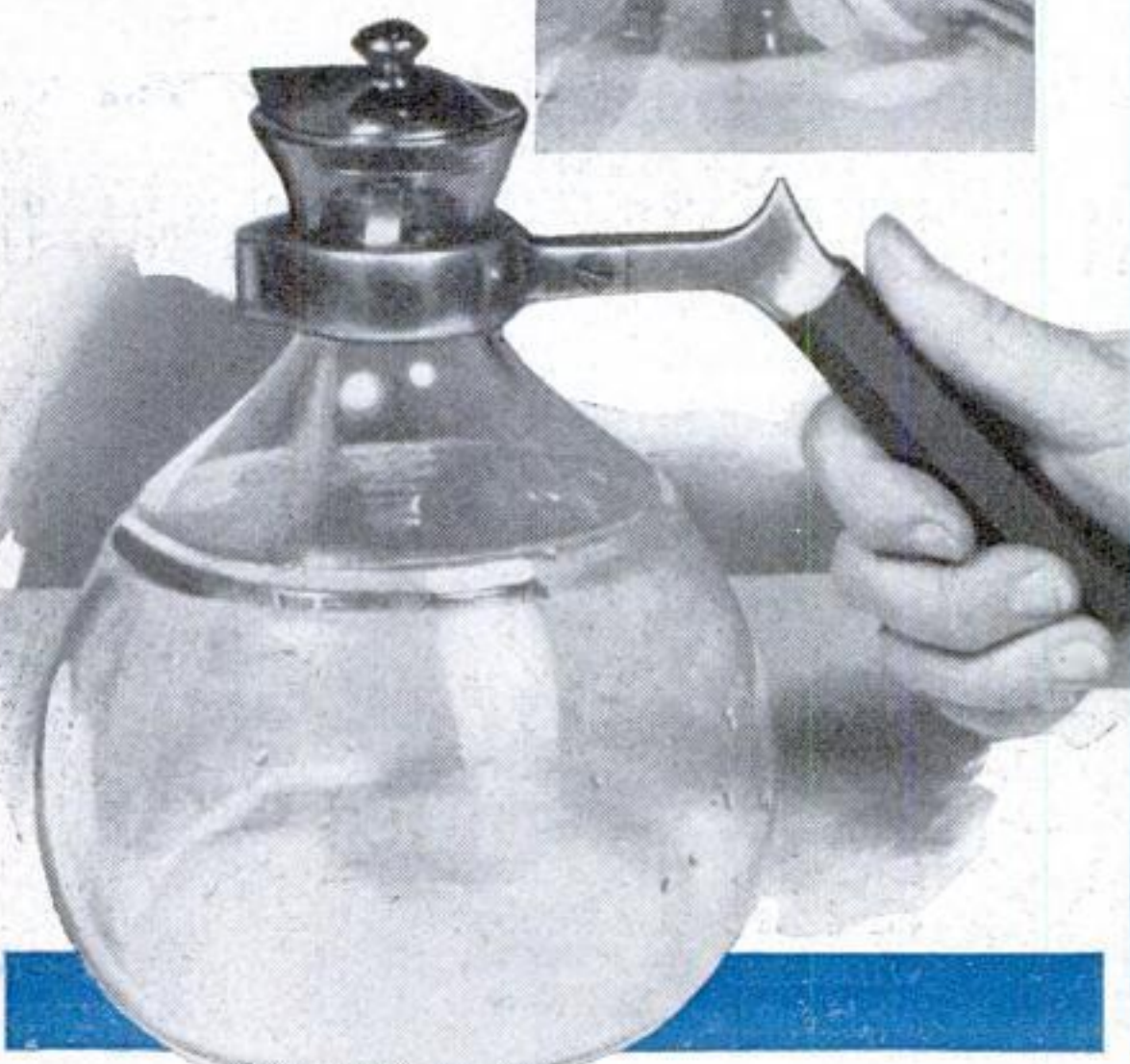


HANDY TOWEL HOLDER

The space-saving fixture seen below has a rubber membrane with diagonal slits that grip the fabric of a towel



NOVEL BUTTER DISH. Butter is protected in the refrigerator, and kept cold and firm on the table, in a glass dish with tightly fitting cover. Holds a quarter pound



Driving a Car by Ear

Every Noise Has a Meaning of Its Own,
But the Ones That Sound the Worst Are
Not Always the Ones That Mean Trouble

FOR the tenth time, John Knowles glanced apprehensively at his oil gauge and nervously tapped its glass cover to reassure himself that the needle hadn't stuck. Then, to make doubly sure, he threw out the clutch and took his foot off the accelerator so that the motor slowed to idling speed. The oil-gauge needle immediately dropped to a few pounds instead of its normal position near the thirty-pound mark. When he speeded up the motor and let in the clutch again, the needle swung up to its former position.

"That settles the oil-pressure question, all right," he muttered to himself. "So whatever that confounded squealing is, it certainly isn't coming from a dry bearing in the motor. With all that oil pressure, I don't see how any bearing could run dry."

The noise continued, however, and was very pronounced when he had to go slowly in traffic.

"I just hope I can get to Gus's place before there's any damage done," Knowles grunted, as he rounded a curve and the sign of the Model Garage came into sight.

Gus Wilson, mechanic and half owner of the establishment, slid open the door at the sound of Knowles's horn.

"Where'd you get the canary?" he asked with a grin, when he heard the chirping squeal that was coming from under the hood of the car.

"Is it something serious?" Knowles asked nervously, after he had stopped in the shop.

"Serious!" Gus grunted, walking over to the car and lifting the hood. "There's no noise a car can develop that sounds worse and means less than that commutator squeal. That's what you've got. Ordinarily, the brushes of the generator slide on the surface of the commutator without making any noise. But once in a while, when conditions happen to be just right for it, the commutator takes on a glaze that causes the brushes to vibrate like violin strings when you scrape a bow over them.

"If you just forget about it," Gus continued as he lifted the hood and applied a screw driver to the dust band over the commutator, "the chances are about a thousand to one that the noise will go away in a day or two, and you may never hear it again as long as you



Gus slid open the door at the sound of Knowles's horn. "Where'd you get the canary?" he asked, when he heard the chirping squeal that was coming from under the hood of the car

own the car. Or it may come back from time to time. If you want to get rid of the squealing, all you have to do is to clean the commutator like this."

He took a small, flat-ended stick, pulled a piece of stout cloth over the end of it, and pressed it against the spinning commutator. The noise stopped at once.

"Always use a piece of wood, never the end of a screw driver," Gus cautioned, "and a stout piece of cloth that won't tear into shreds and get caught under the brushes. If it still squeals a bit after a cleaning like this, put just the tiniest trace of petroleum jelly on the cloth and try it again. That'll cure the most stubborn case of commutator squeal you'll ever run across."

"That's a relief, Gus," said Knowles. "Put it on my bill."

"That'll be a big item," Gus laughed. "'Killing one canary—ten cents.' Forget it!"

"All right, then, fill up the gas tank and check the oil," Knowles smiled. "I suppose you think I'm an awful nuisance, Gus," he went on, after he had backed the car out to the pump, "but I can't help worrying when I hear any funny noise."

"It's a lot easier on your pocketbook to be that way," Gus grunted, as he unhooked the gas hose and started the pump motor, "than it is to be one of those birds who never suspect there's anything wrong till a wheel drops off or the motor quits cold.

"The big thing," he continued, "is to get to know which noises mean things that don't amount to much—like that commutator squeal, for instance—and the noises that spell trouble coming. Take brakes that howl just as you come to a stop. There's a noise that doesn't necessarily mean that the brakes are going bad. Sometimes, after a couple of thousand miles, the brakes on a new car will develop a squeal that will last for a few days and then go away for (Continued on page 148)

By MARTIN BUNN

THE HOME WORKSHOP

DECORATIVE Folding Screens AND HOW TO MAKE THEM



Fig. 1. Screen made from a grass-matting rug glued between frames of window-stop molding

IN THE construction of folding screens, the amateur craftsman has an exceptional opportunity to create something that is beautiful in itself and also of considerable utility. One or more screens can be used in almost every home as a decoration, to add a bit of light or color to an otherwise bare wall or corner, to conceal some unsightly object, or to block off part of a room.

One attractive screen illustrated (Fig. 1) is nothing more than sections of a Japanese grass rug glued between frames made of window-stop molding. The molding should be rabbeted on the back to provide a recess for the matting, and the corners should be strengthened with metal braces (Fig. 2). Any design on the rug should be carefully matched on the different panels. Other coarsely woven fabrics, such as monk's cloth or burlap, could be substituted for the grass matting with equally good results.

For a lighter screen, a thin cloth can be used for the panels, and the frame made of metal tubing. In Fig. 3 the frame is an aluminum tube, and the panel is of silk. The tube is slotted with a hack-saw blade and shaped on a form (Fig. 4). If the tube is cut open

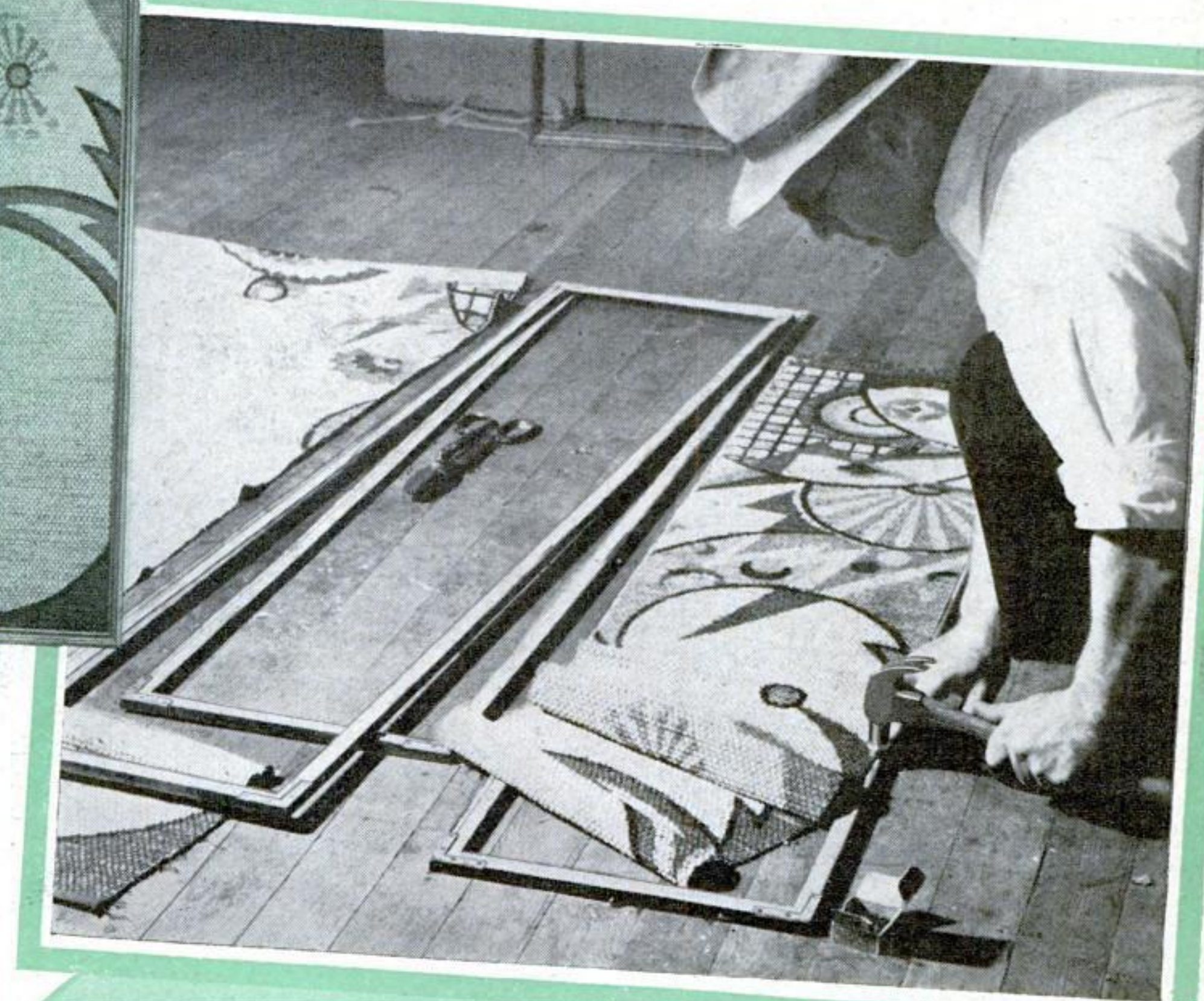


Fig. 2. Tacking matting on the back of one of the frames. The molding is rabbeted on the back to form a recess for the matting

**Wood and Metal Frames—
Matting, Silk, and Wall-Paper**

**Coverings—Plywood and
Wall Board—Photomurals**

By
**MERLE
TERRILL**

before bending, the curved section should be filled with lead to keep it from kinking. After the tube is bent, the lead can be melted out.

The cloth is doubled, and the edges are sewed together to form a sack like an oversize pillowcase. The edge of the

cloth is slipped into the tube and held by sliding a coil spring, such as a spring curtain rod, into the tube and inside the cloth (Fig. 7). The spring is pushed all the way around, pulling the cloth into the tube and holding it securely.

Before fastening the cloth to the frame, however, a wooden rod, to which the cloth is attached (Fig. 6), is slipped inside the bottom tube. A short length of tube is split in half and screwed onto each end (as in Fig. 5) and then slipped into the side frame as illustrated. After the cloth is fastened to the frame all around, the crosspiece is pulled down to stretch the cloth, and secured with small screws.

In making solid screens, either plywood or hard-pressed composition board may be used. For a novel ef-

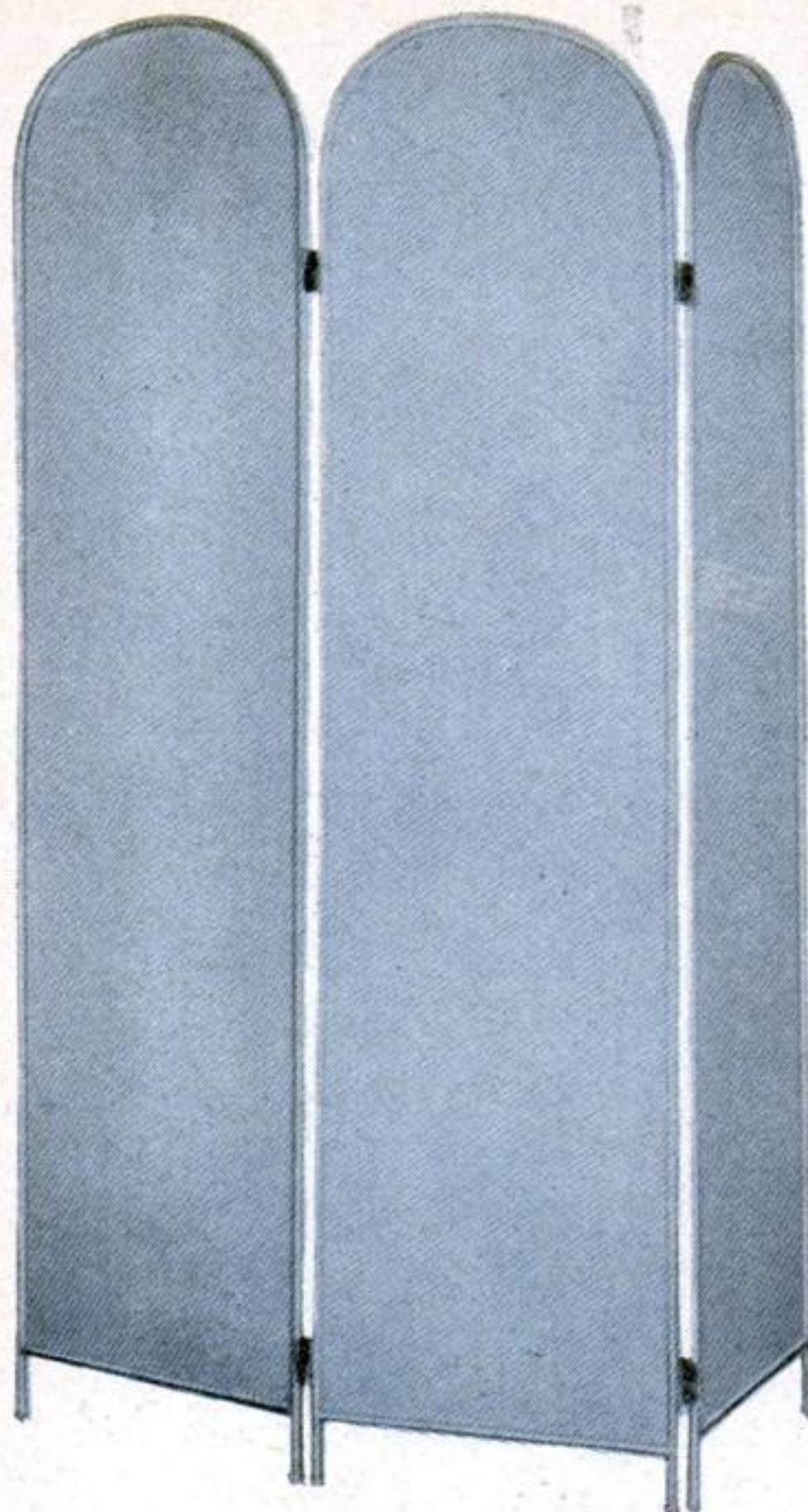


Fig. 3. Frames are of aluminum tubing, panels of stretched silk

fect, try this: Boil a piece of $\frac{1}{8}$ -in. hard-pressed board in water for fifteen minutes and clamp it over a curved form until dry. Cover it with flexible wood or the less expensive imitation woods made on paper. If you construct the screen in sections, hinge the sections together with copper hinges made as detailed in an accompanying drawing because the thinness of the panels will not permit regular screen hinges to be used.

Although screen panels may be made of solid plywood, a better way is to

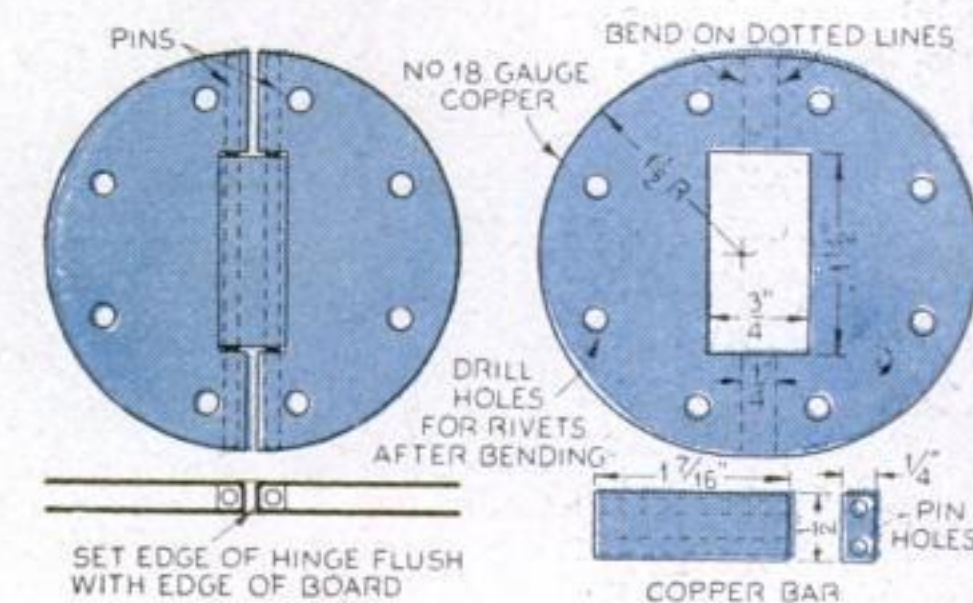
glue sheets of $\frac{1}{8}$ -in. plywood on each side of light frames. This will give a lighter screen and will also eliminate twisting, which is apt to occur if a single sheet of thicker plywood is used.

For a truly beautiful screen, there is nothing like a photomural. If you can

make your own enlargements, a photomural like that shown below need not cost more than three dollars. If possible, buy the paper in rolls and make the panels in one piece to avoid seams. If you cannot avoid seams, make the picture so that the sections overlap a little; then when you mount them, slip a thin strip of metal under the overlapping portion and cut through both sheets with a razor blade. This will result in a perfect joint.

To make a sketch for a special screen, fasten a sheet of paper on the wall and project a photograph onto this as a guide.

Also, don't overlook that old standby of folding screens—wall paper! You can find hundreds of designs and colors, ranging from small figures and all-over designs to large tapestries and colorful landscapes and murals.



If thin, hard-pressed composition board is used, special hinges are made from copper

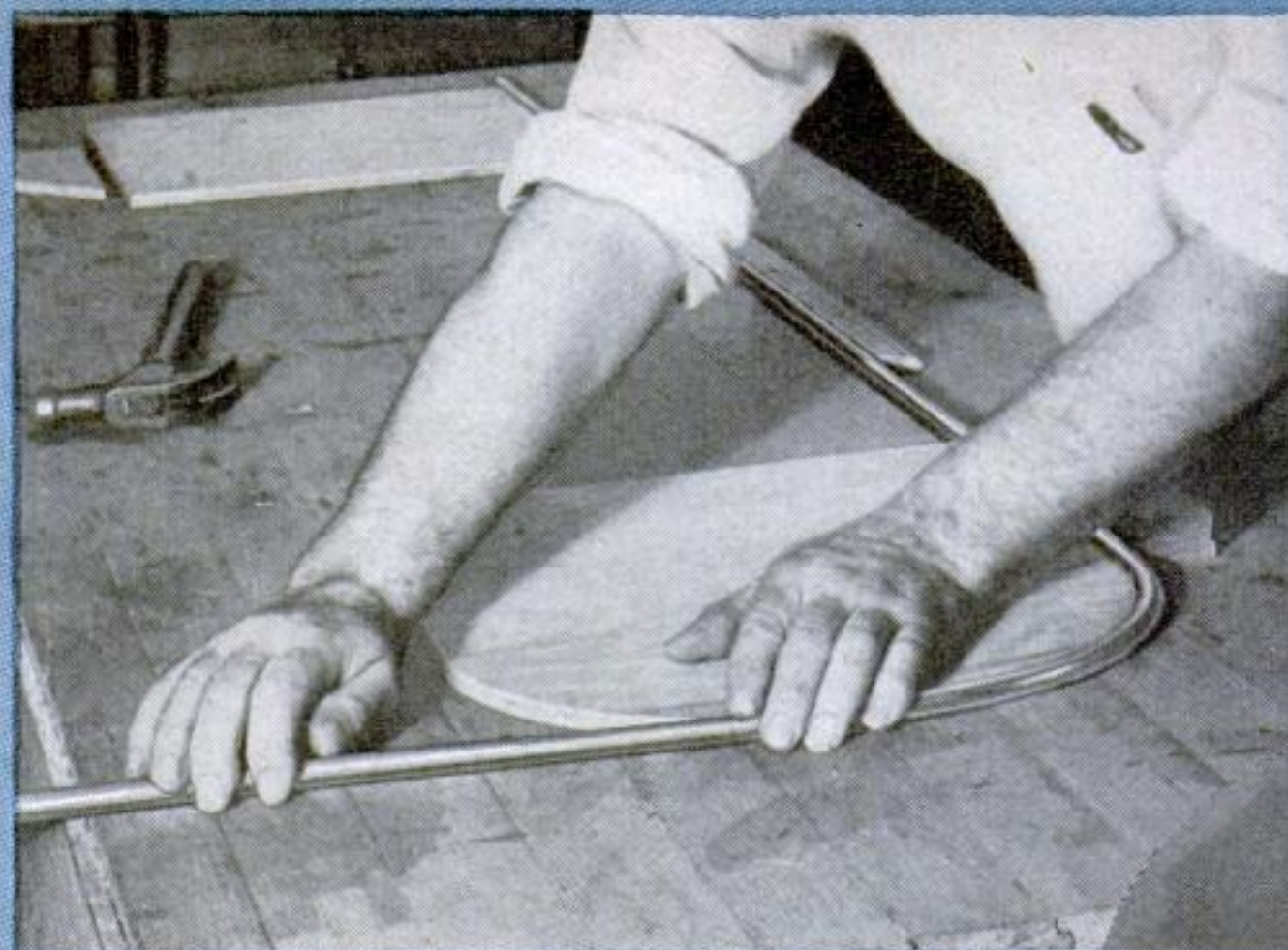


Fig. 4. The tubing is bent over a form after being slotted and filled with lead at the curved section to prevent kinking



Fig. 6. How the rod is pushed through the doubled cloth

Fig. 7. Inserting the spring. Later the crosspiece is pulled down tightly

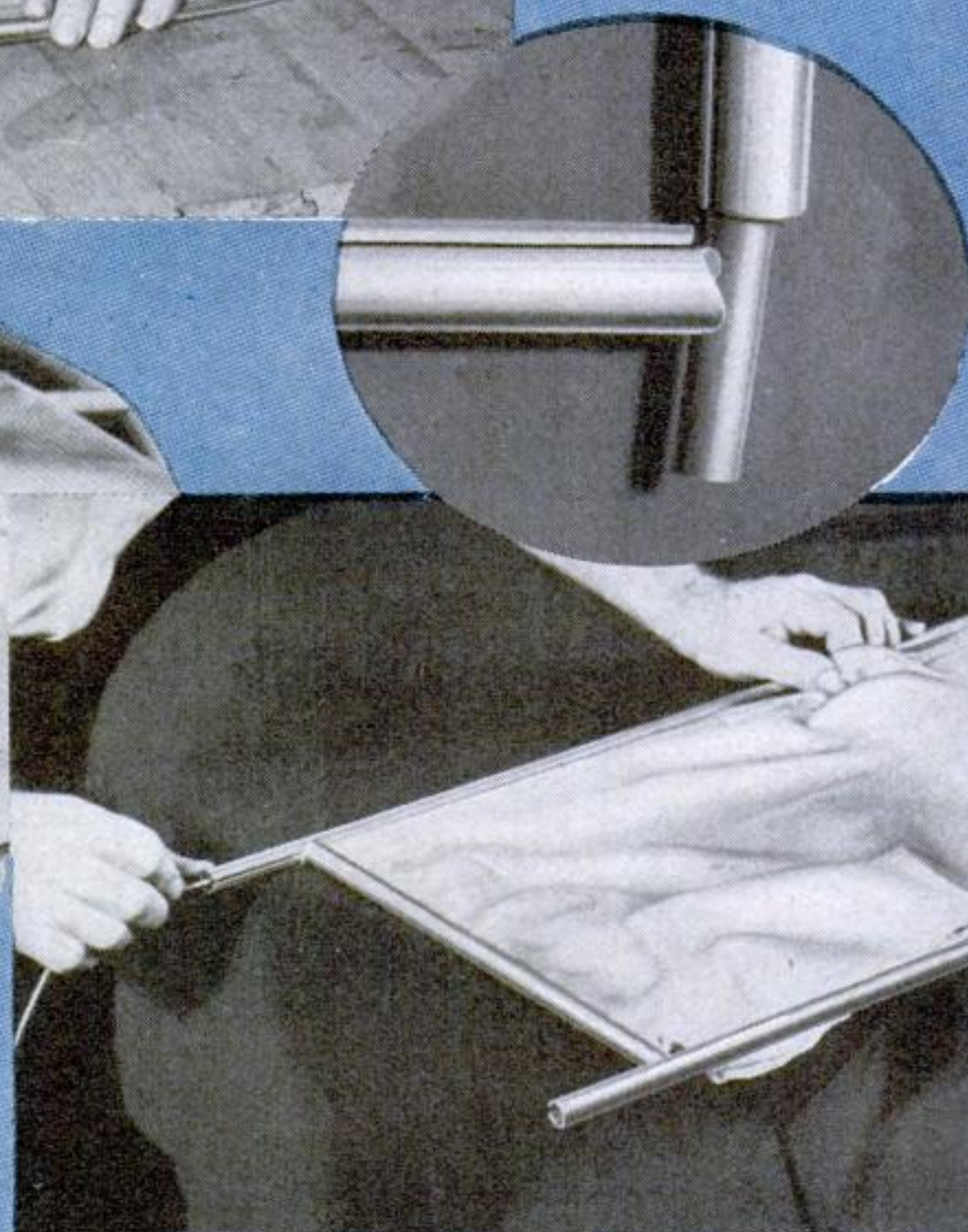
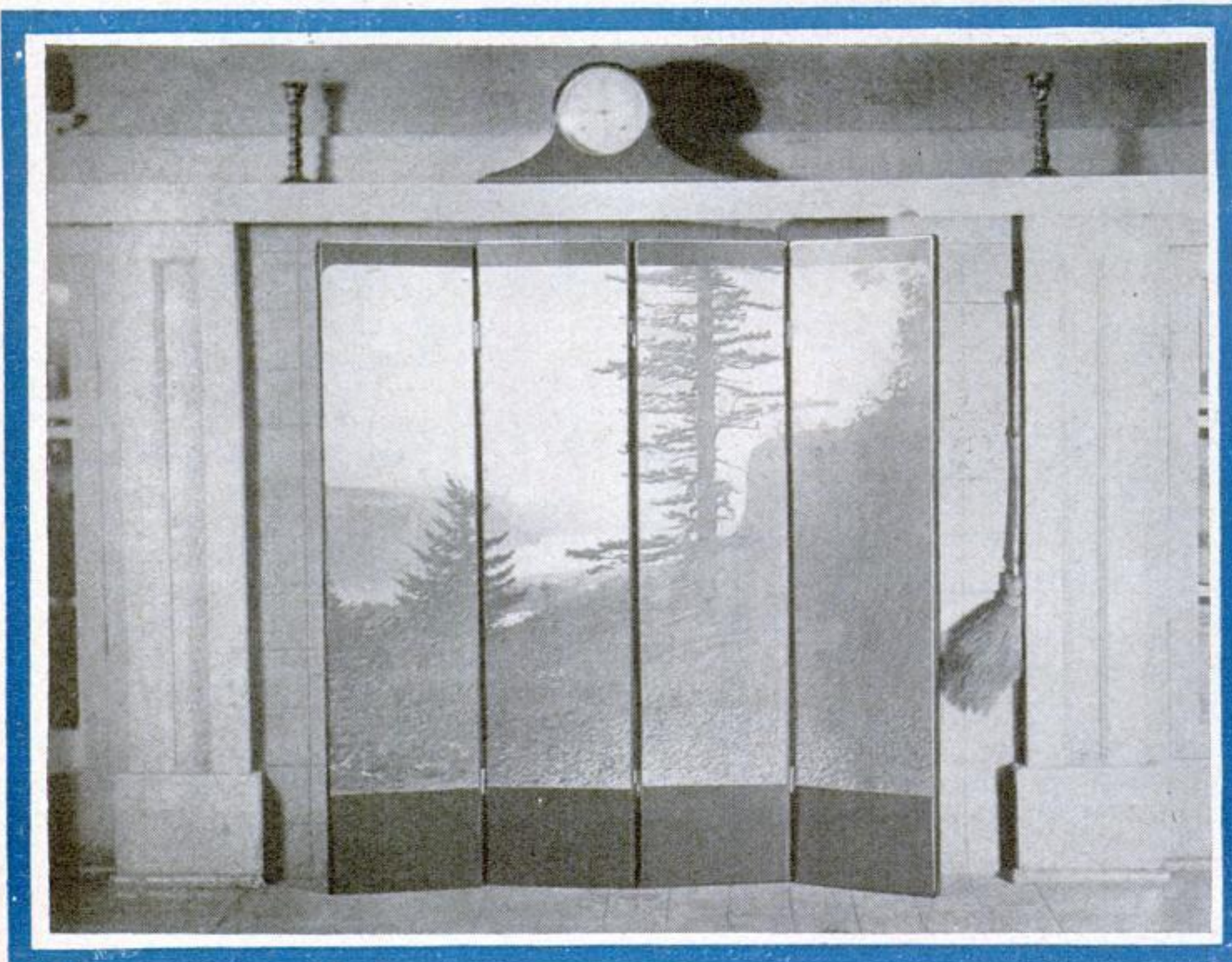
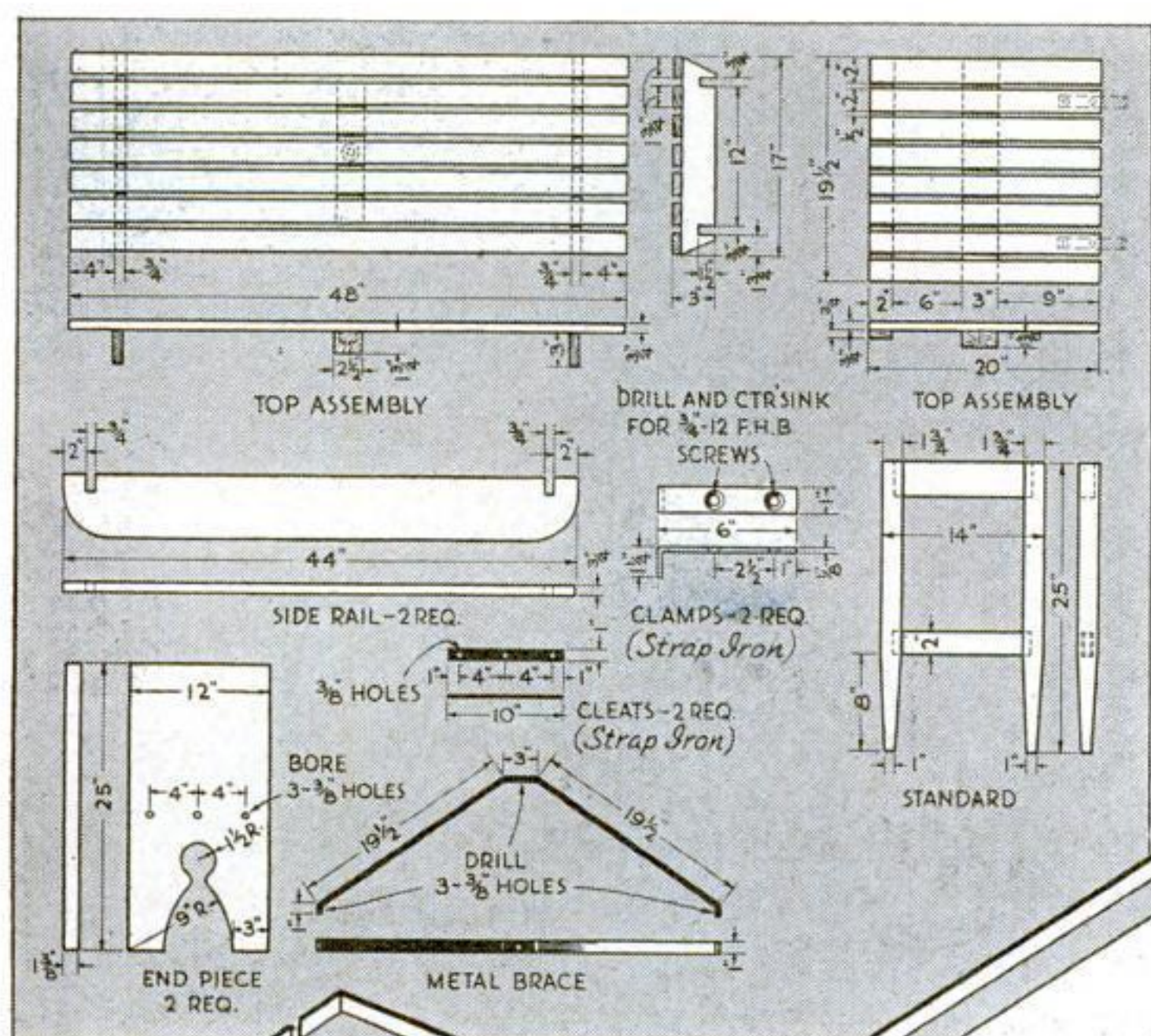


Fig. 5. Lower joint showing short half section of tube fastened on end of rod

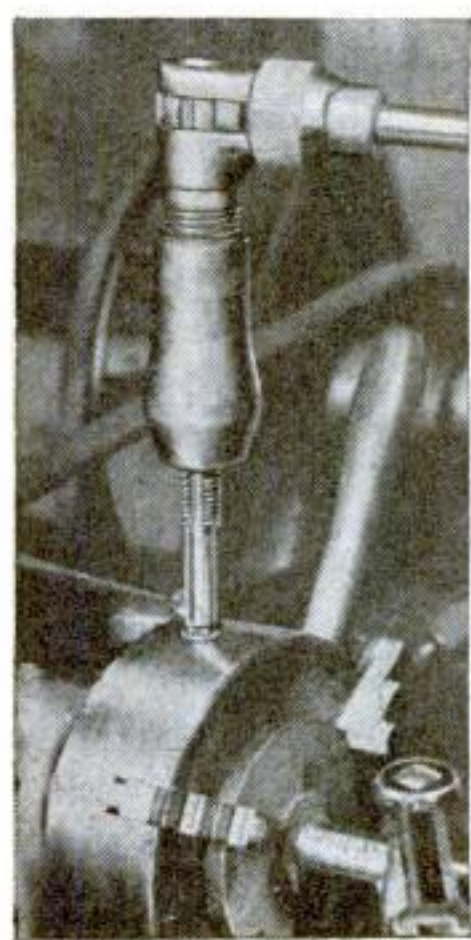


Laundry Bench FOR USE WITH WASHER



The working drawings and a view of the assembly as if seen from underneath

Lathe Chuck Jaws Adjusted with Carpenter's Brace

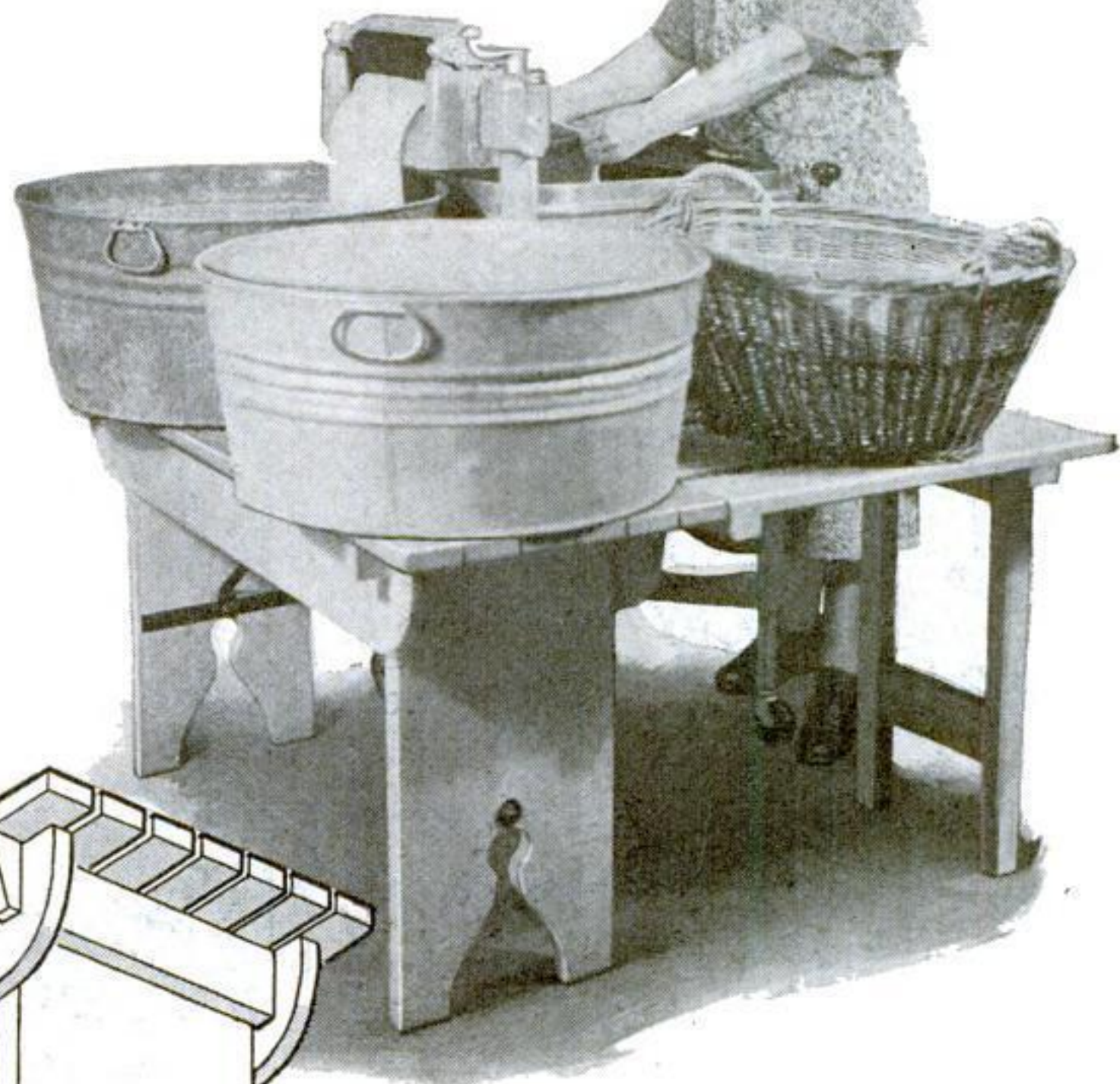
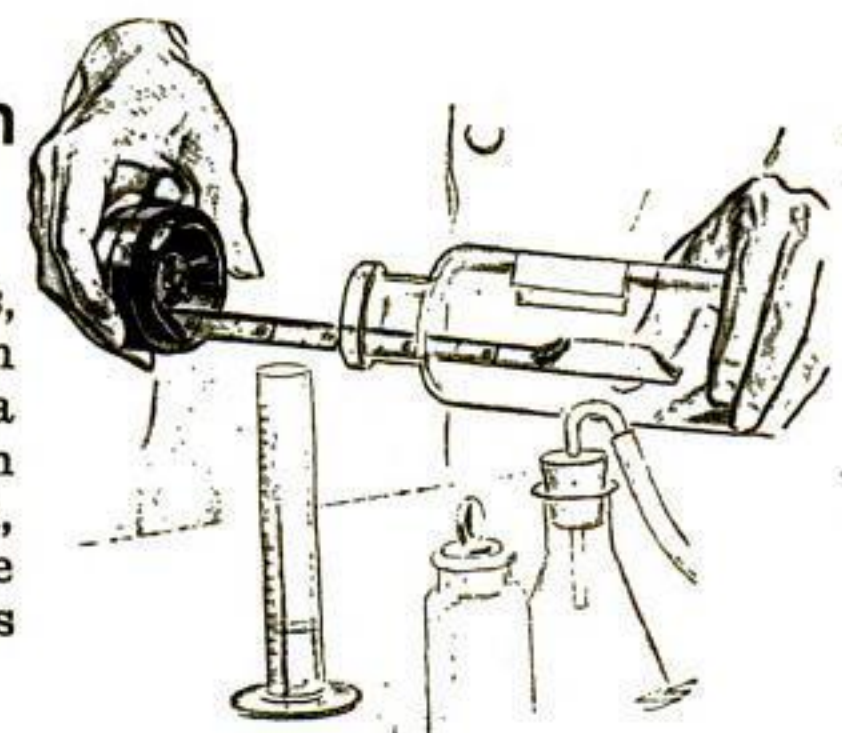


LATHE-chuck jaws can be run in or out quickly by inserting the square end of a $\frac{5}{8}$ -in. tap and using a carpenter's brace to turn it, as illustrated. This method is particularly useful on large chucks where the friction is too great to permit the jaws to be adjusted with a breast-drill set-up.—W. W.



Steel Tape Used as Spoon to Reach into Bottles

WHEN small quantities of dry pigments, dyes, or other shop chemicals are to be removed from deep, wide-mouthed bottles, there is rarely a suitable spoon at hand. A good substitute in such cases is a steel pocket tape of the type shown, which is curved and quite stiff. It will also serve for mixing and stirring, provided the mixture is one that will not injure the metal.



The bench holds the tubs close to the wringer, and there is a removable stand for the clothes basket

FOR use with a modern washer, I constructed the laundry bench illustrated. It is just the proper height to bring the top of the tubs up near the wringer, and much back-bending labor is saved. As a new feature, I added a removable stand for the clothes basket.

The drawings and list of materials at the end of the article give all the essential information for building a similar bench and stand. The ends of the bench are made from 1 $\frac{3}{4}$ -in. stock, finished 12 in. wide; the top, from several narrow strips because a solid top, being frequently wet, would be likely to warp badly. The ends are reinforced with 1-in. by $\frac{1}{8}$ -in. band iron, and similar metal strips are used for braces between the ends and the top. While this is not essential, the use of the strap iron will add years of service to the fixture.

The stand is attached to the bench with a pair of metal hooks or clamps made from the same strap iron, which is easily (Continued on page 127)

A sparkling white Christmas tree may be obtained by spraying it with calcimine and dusting it with powdered mica "snowflakes"



By
RALPH G. WARING

Crystallized Christmas Trees



SPARKLING, all-white Christmas trees may be prepared by several simple methods so as to rival the beauty of soft, feathery snow as it clings to the green needles of spruces and firs. Trees thus frosted provide a new type of background against which to display colored lights and glittering ornaments.

If an ordinary cut tree is to be used—not a growing tree—a good coating consists of the so-called "washable" or casein-base type of calcimine. Mix this in the proportions of one cup of the prepared calcimine to one cup of water. Stir well, strain through cheesecloth, and put in a garden hand spray, preferably of the continuous-spray type because this form of "gun" will give smoother results.

Set the tree up firmly in the yard and apply the first coat. After this is dry, spray on a second coat and, while the calcimine is still wet and sticky, dust the tree with powdered mica flakes, sold in packages for use as Christmas-tree "snow." These flakes will adhere at countless angles and reflect light in a realistically glittering form like genuine snow crystals.

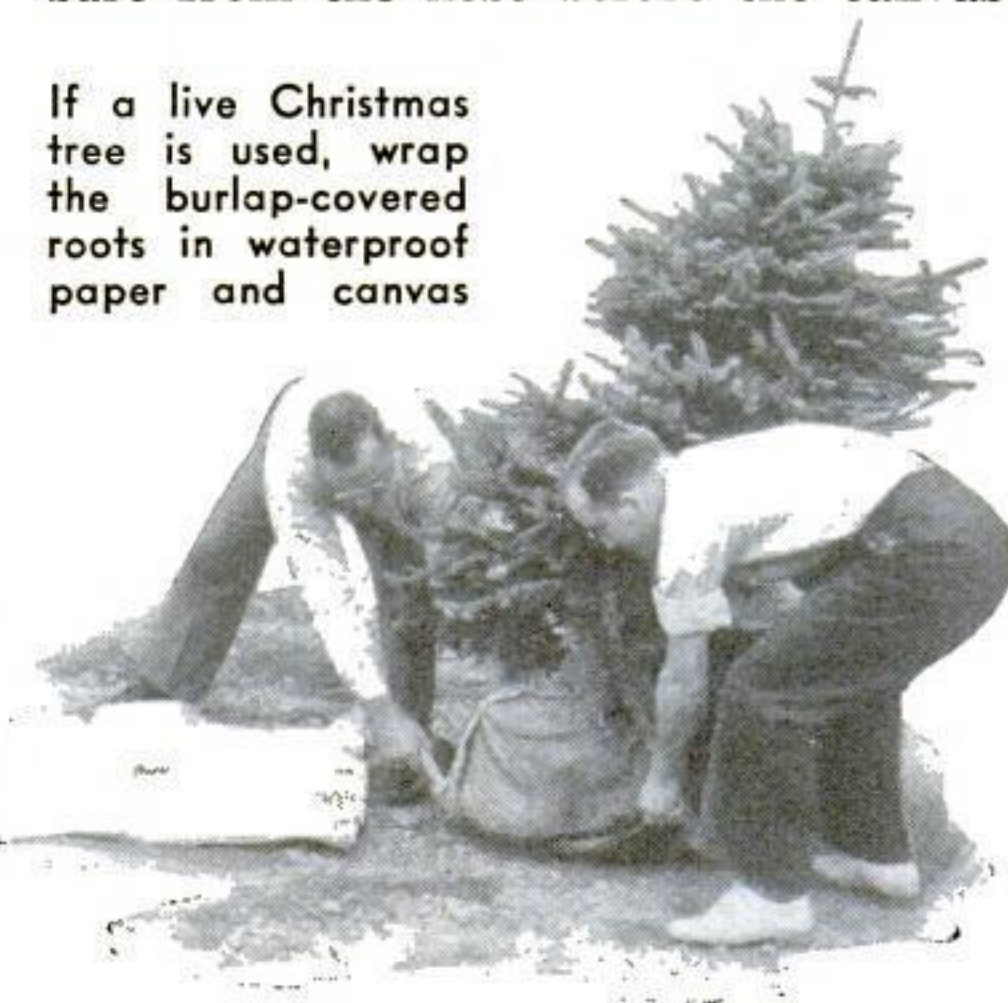
The tree may be removed indoors whenever you are ready to decorate it, or it may be left to stand outside, if you wish to use it for an outdoor ornament.

My Scotch ancestry makes me revolt at the idea of cutting down good

trees for only a few weeks' use, so I prefer to purchase a fine specimen at the nursery, even at double the usual cut-tree rate. The tree is dug up with a large ball of earth around the roots, and this is wrapped in burlap, waterproof paper and clean canvas to permit it to be brought into the house. After the Christmas holidays, the tree is replanted in a reserved space in the garden that has been kept from freezing by a previously applied straw, manure, leaf, or peat-moss mulch.

A live tree may safely be whitened by applying a coat of ordinary glue-base calcimine of the nonwashable type. The coat should afterwards be washed off with a fine spray under water pressure from the hose before the canvas

If a live Christmas tree is used, wrap the burlap-covered roots in waterproof paper and canvas



around the roots has been taken off. This is done so that no lime can get to the roots of the replanted tree.

For indoor use, either type of tree may be given an alternative treatment. Dissolve an ounce of alum in a quart of hot water, and use this in mixing nonwashable or common calcimine, the proportions being one cup of liquid to one cup of powder. When the mixture has been strained and sprayed on the tree, the alum crystallizes out to give a luster entirely different from the mica flakes. A second spraying with hot water containing two ounces of alum to a quart will greatly enhance the crystalline effect.

If this treatment is applied to the usual cut form of Christmas tree, the needles will adhere for a much longer period than would ordinarily be true of the unsprayed tree.

Those who live where the Christmas weather is usually cold and clear without snow can have a glittering outdoor tree by applying a mist spray of warm water to the tree at such a distance and rate that the spray freezes to the tree almost as fast as it falls. Perhaps even the garden hose with the nozzle set at a very fine mist would do the trick.

Another ef- *(Continued on page 119)*



Get in Step

...JOIN THE NATIONAL HOMEWORKSHOP GUILD



Official Magazine
POPULAR SCIENCE
MONTHLY

H EADLINES in newspapers throughout the country reflect the success of the National Homeworkshop Guild and its affiliated clubs.

Wide-awake programs and varied activities have created news of a type not heretofore recorded by the press.

Newspaper clippings, photographs, and reports submitted to Guild headquarters during the past few years are a definite indication of this. The few clippings reproduced above are just a sample of hundreds of similar news items in the Guild's records.

The amateur craftsman no longer works entirely by himself. Instead, he belongs to a home workshop club where he learns more about his hobby and participates in projects that interest the entire community. He has become an integral part of a movement that is sweeping the nation.

Every intelligent home workshop enthusiast has come to realize that his hobby has taken on a new significance since the National Homeworkshop Guild began sponsoring clubs. There is, in fact, no better way to improve one's craftsmanship than by joining a home

workshop club. Demonstrations, lectures, moving pictures, exhibitions, and the like, which are a part of every club's programs, are planned with the thought of assisting members with their work. As a result, each annual home workshop exhibition held by a club reveals a definite advance over the preceding one: the projects are more varied and more expertly finished with respect to details.

If you want to participate in the benefits that membership in the Guild can give you, organize a home workshop club in your community now. Monthly bulletins containing a wealth of ideas and information, job sheets, surveys of available program material, and lists of agencies lending moving pictures without charge are sent to each club (see P.S.M., Oct. '37, p. 101). These services, all of them free, will help you build up a club that is a vital force in your city or town.

It's easy to start a home workshop club and, once formed, you will be surprised to find how many other persons will become interested in it. To help you get started, the Guild has prepared a special three-page bulletin containing full instructions. This bulletin and an application blank will be sent gratis upon receipt of a large, self-addressed envelope bearing a three-cent stamp.

The Guild will recognize as a club any group of five or more persons who are at least sixteen years of age. There are no obligations attached to joining the Guild. All its services—as well as a charter and annual affiliate cards for the members—are free, because the sole purpose for which it was founded four years ago was to promote the home workshop hobby.

Get in step with other amateur craftsmen by becoming affiliated with the Guild. Clip out the coupon below or write a letter now. Failure to take advantage of this offer means that you are foregoing a great opportunity.

National Homeworkshop Guild
347 Fourth Avenue, New York

Please send me, without cost or obligation, full particulars on how to organize a home workshop club. Tell me how my friends and I can belong to the National Homeworkshop Guild, and what the Guild will do for us.

For your use in sending me this material, I am inclosing a large (legal size), self-addressed, stamped envelope.

NAME.....

ADDRESS.....

CITY.....STATE.....

(Please print very clearly)

THE EXPERT'S High-

Riding out on one of New York's popular ski trains last winter, a member of our staff sprang a particularly hard question about the design and construction of skis on a group of expert skiers. It had them stumped, and at length one of them said, "That's something it would take Andre himself to answer!"

We found out later that there was good reason for this remark, for Andre has almost literally lived his life on skis. He started when he was six years old . . . spent half of his enlistment in the Finnish army on skis . . . and later skied in Russia, Switzerland, Canada, and United States. He is an authority on the construction, care, and repair of skis.



The tip of the ski is wrapped heavily in burlap, boiled for half an hour, then bent and left to cool

Lines are squared across the billet at points marked A, B, C, D, and E in Fig. 1 opposite

SKI HEIL! Are you a skier, or do you want to be one? If so, start now to make a pair of skis so that you can enjoy the thrill of shooting down snow-covered hills or skiing cross-country when winter comes.

Practical experience and scientific research have proved hickory to be the best wood for making skis. Compared to ash, second best, it has approximately 25 percent greater strength in compression and 20 percent in bending, contains 75 percent greater shock resistance, and is 40 percent harder.

A ski reaching the base of the palm when the hand is stretched overhead is about the right length, although the racer and the fast skier will prefer one from 3 to 5 in. longer. An average length is 7 ft.

To make a pair of 7-ft. skis, select two pieces, or billets as they are usually called, of hickory or ash $1\frac{1}{4}$ by 4 in. by 7 ft. 6 in. Pay special attention to the grain; it should run straight the entire length of the ski. Discoloration, knots, and other irregularities are not permitted in an ideal pair of skis, which should be matched for weight, flexibility, bend, and flat grain. If the billets are damp or have been stored out-of-doors, keep them in a warm, dry room for several weeks.

Plane one narrow and one wide surface at right angles. In the exact center of each billet on the wide-planed side, cut a groove $\frac{1}{2}$ in. wide and $\frac{3}{16}$ in. deep with a rounded bottom, beginning one quarter way from the tip

WAY OF MAKING Grade Skis

... and it's the easiest way, too

By
JULES E. ANDRE



In forming the necessary arch or camber under the middle section, the grooved surface of the ski is heated with a blowtorch and bent inch by inch over a bench or other readily moved object as shown at left. Below, waxing the finished ski

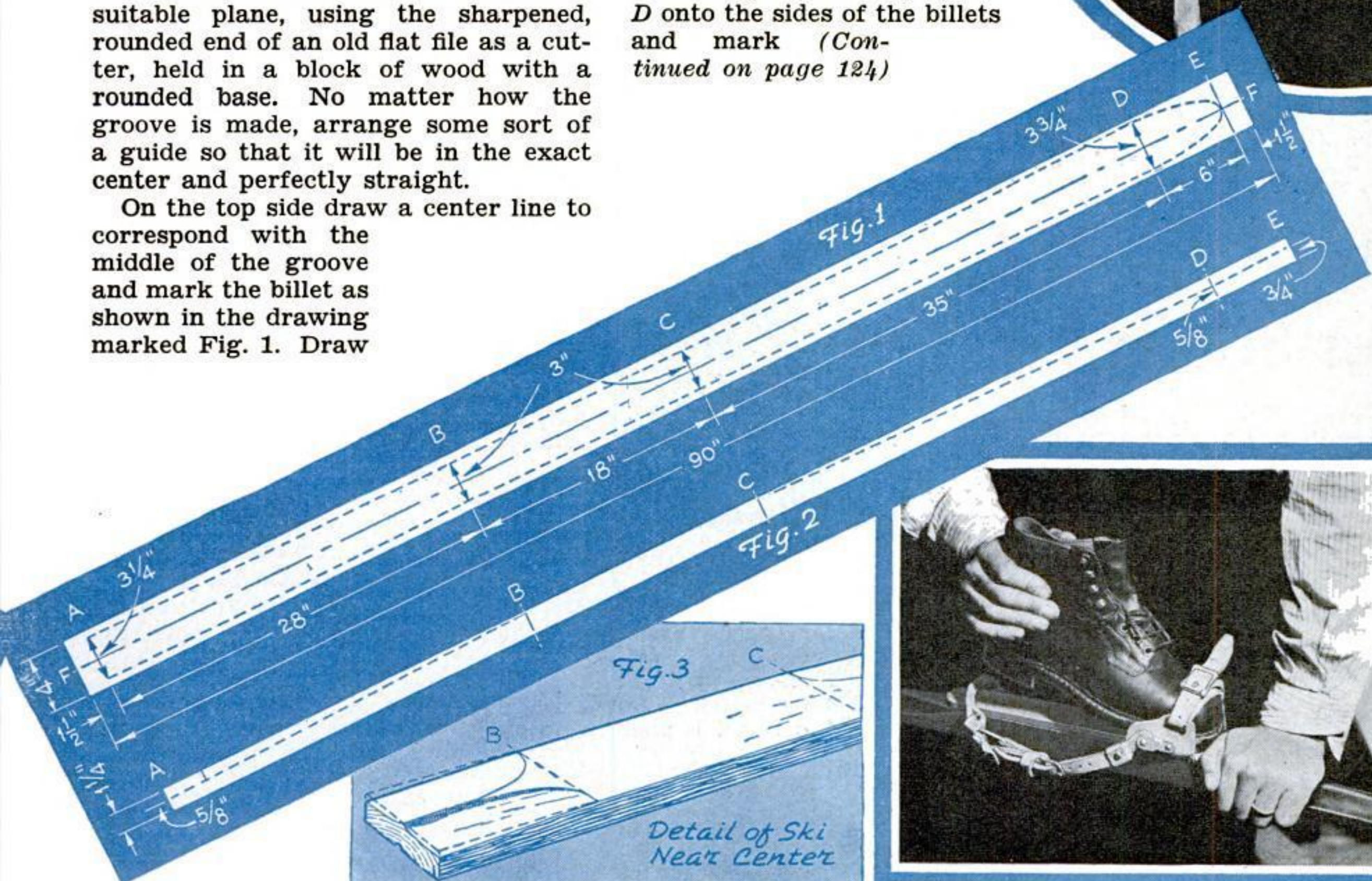
and continuing to the back end. The beginning of the groove should be gradual.

Special planes are available for cutting grooves, but if you do not have one, the operation may be done in one of several other ways. About three close cuts can be made on the circular saw, the wood then gouged out, and the groove smoothed with sandpaper attached to a dowel. If no power saw is available, the entire groove may be cut with a gouge, but remember that it must be absolutely straight. Ingenious craftsmen will be able to fashion a suitable plane, using the sharpened, rounded end of an old flat file as a cutter, held in a block of wood with a rounded base. No matter how the groove is made, arrange some sort of a guide so that it will be in the exact center and perfectly straight.

On the top side draw a center line to correspond with the middle of the groove and mark the billet as shown in the drawing marked Fig. 1. Draw

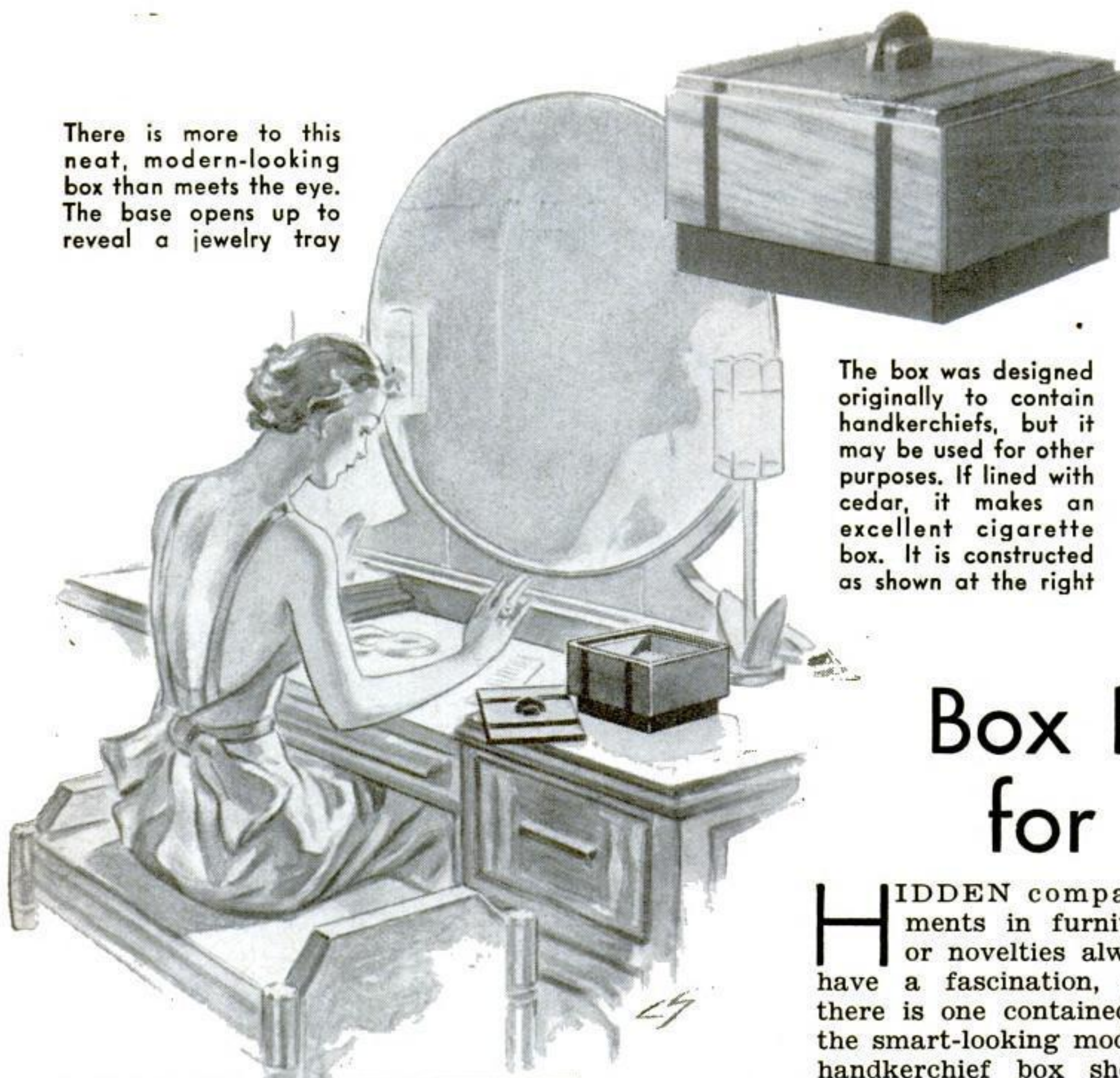
a line connecting all the points, beginning at A and prolonging it in a full curve to the intersection of E and F. A short tongue about $\frac{1}{2}$ in. wide is often left at the very tip, but a fully curved end is easier to shape. Saw or shave the wood on these lines and cut off the end at A. Use the resulting ski-form to draw the pattern on the second billet, taking care that the grooves coincide.

Prolong the lines B, C, and D onto the sides of the billets and mark (Continued on page 124)

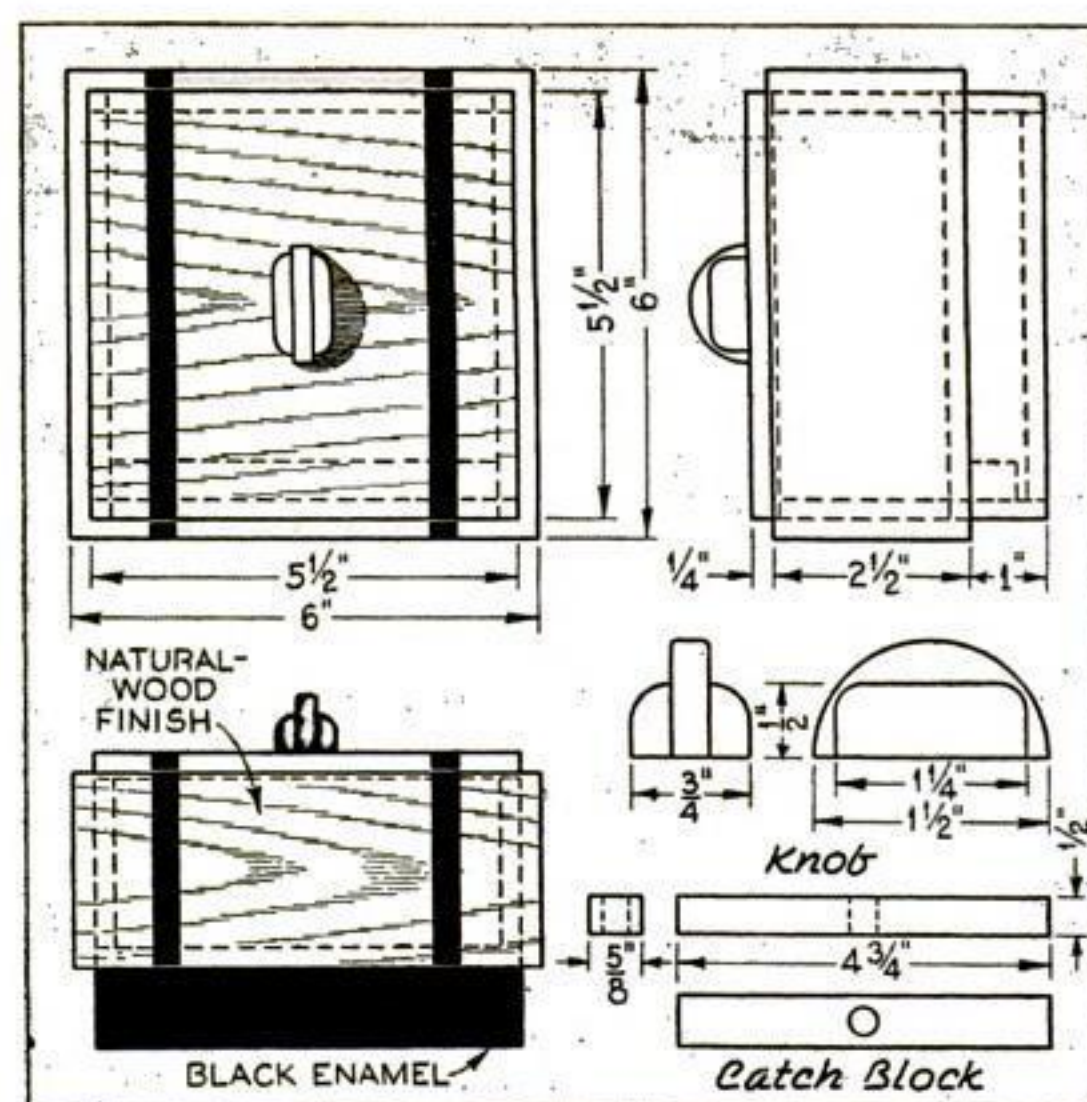


Fastening the toe iron and, at left, the complete harness and ski boot

There is more to this neat, modern-looking box than meets the eye. The base opens up to reveal a jewelry tray



The box was designed originally to contain handkerchiefs, but it may be used for other purposes. If lined with cedar, it makes an excellent cigarette box. It is constructed as shown at the right



Box Has Secret Tray for Hiding Jewels

HIDDEN compartments in furniture or novelties always have a fascination, and there is one contained in the smart-looking modern handkerchief box shown

in the accompanying illustrations. The box may, of course, be used for other purposes. By lining it with cedar, for example, it can be converted into a cigarette chest.

Build the upper part of the box first, using walnut or some other hardwood. Simple butt joints are strong enough, but if a circular saw is available, more elaborate joints of the rabbeted variety may be attempted.

The cover, of the set-in type, rests on the tops of four 1/4-in. square wooden braces. If desired, hinges may be added. The knob is of modern design, as shown. All pieces are securely fastened with a few small brads and glue.

For the base, make another small box of pine or whitewood. Instead of nail-

ing this in place, hinge it to the bottom of the upper box with two small brass hinges. A spring-and-ball cupboard catch holds the base in position on the front side. This is set into a narrow strip of wood, which, in turn, is screwed to the bottom of the upper box. The strike plate is screwed to the inside of the base.

Hinges and catch should not be noticeable from the outside. The base should appear to be nailed to the upper box and should open only when a strong pull is exerted on the bottom.

The choice of finish depends on the materials used and the craftsman's taste. The model illustrated was finished in natural wood color with two black stripes enameled in the positions indicated. The base was finished with black enamel.

As an added convenience, divide the jewelry compartment into spaces for rings, pins, and other trinkets. Line all divisions with plush. Give the inside of the upper box two good coats of thin shellac.—GEORGE B. HARRAN.

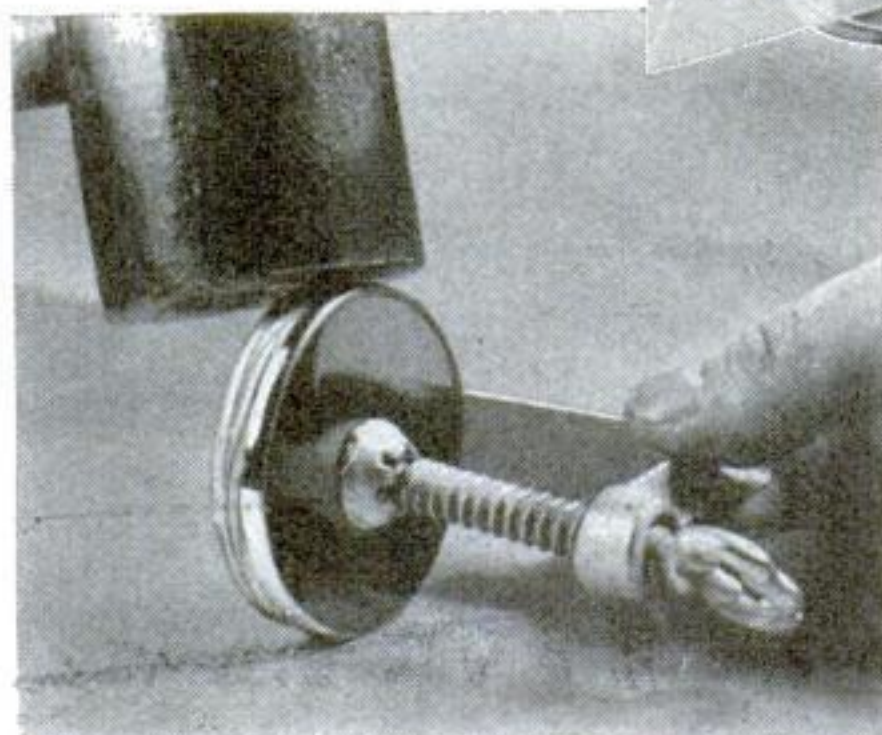


The secret compartment for jewelry in the base is opened by giving it a strong pull

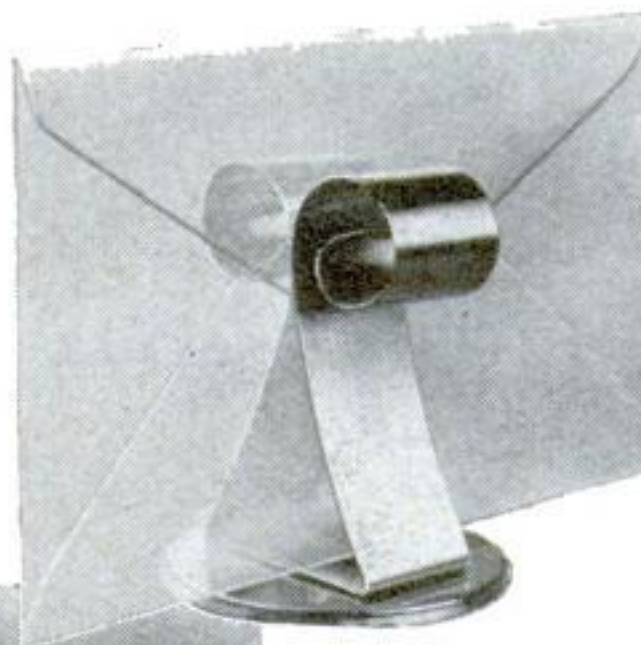
Letter Holder Formed of Brass Scrolls

THIS novelty letter holder will keep as many as twenty-five letters together until they are mailed. The base is shaped from a disk of nickel-plated zinc or other suitable metal. This may be done by clamping a 2 3/4-in. disk of the metal to a 2 1/2-in. plywood disk and turning the edge with a wooden mallet, as illustrated at the right.

To the base rivet a 12-in. length of spring brass 1 in. wide. Trim the corners of the latter, then bend the ends into the shape of two scrolls. Coat the brass with thin lacquer to preserve the bright finish.—W.K.



A phantom photo showing both scrolls of the letter holder. Left, a mallet is used to turn the edge of the metal base over a wood disk



Old Meat-Saw Blades Useful in Shop

DISCARDED butchers' meat-saw blades, purchased from a local meat market for a few cents each, are useful for various craftwork purposes. To hold them, you can buy a second-hand saw frame, borrow one from your butcher, or devise a wooden bucksaw.

Recently I had to cut 2 in. from the end of a marble slab 2 in. thick and 18 in. wide. An ordinary hack saw was not large enough, but I did the work with three butchers' saw blades. They are a bit dull when the butcher discards them, but sharp enough for other uses. For example, I cut the bottom from a clay flowerpot by scoring it gradually with a saw blade. The open part of the pot was then used to hold a melting ladle over a stove.—N. F. DEGAGNER.

GIFT CRAFTWORK



Novel Totem-Pole Smoking Tray

FOR those who enjoy whittling, this totem-pole ash tray and pipe rest is an unusual and highly decorative project. The base may be modified, if desired, to serve as a pen-and-ink stand.

The tools necessary are a sharp, thin-bladed knife, several small chisels and gouges, hand drill, ball-peen hammer, sandpaper, and small paintbrushes. Materials: 1 pc. gumwood or other close-grained, easily carved wood $\frac{7}{8}$ by $\frac{7}{8}$ by $11\frac{1}{2}$ in. for pole; 1 pc. $\frac{5}{16}$ by $\frac{7}{8}$ by 4 in. for wings; 1 pc. $\frac{3}{16}$ by $\frac{3}{8}$ by 1 in. for nose; 1 pc. $\frac{1}{4}$ by $1\frac{1}{4}$ by $1\frac{1}{4}$ in. for base at bottom of pole; 1 pc. $\frac{3}{4}$ by $3\frac{3}{8}$

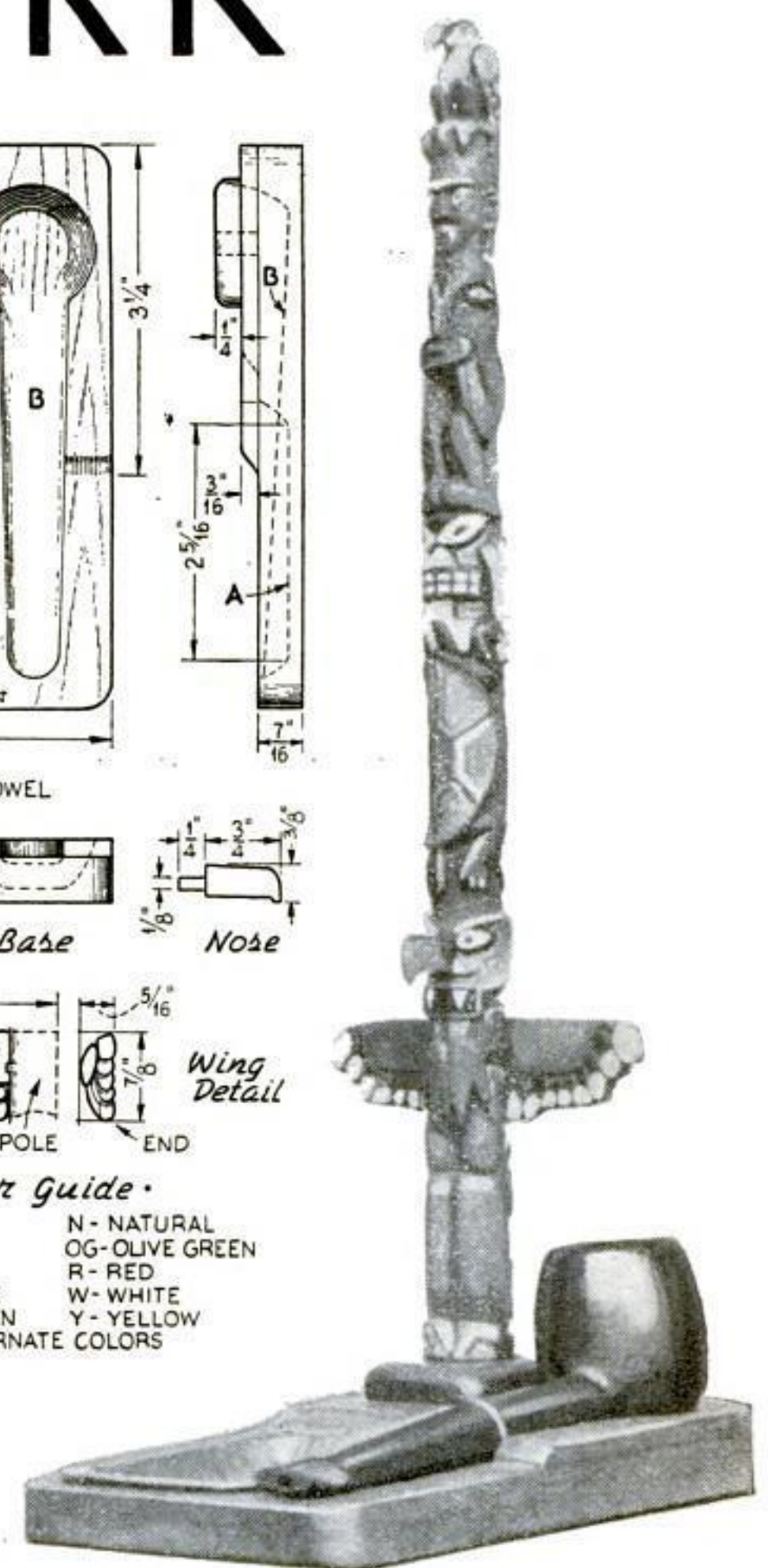
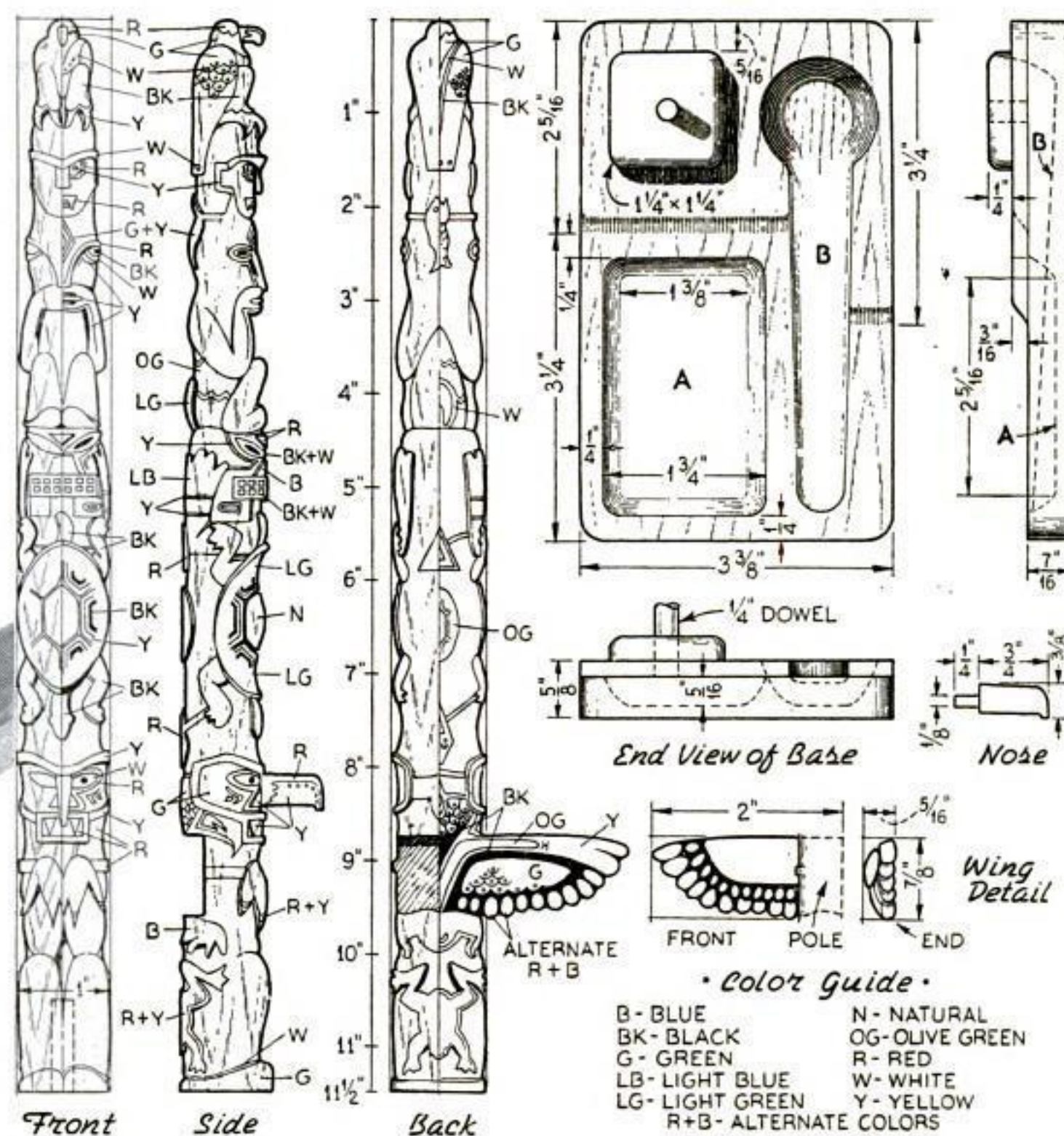
by $5\frac{5}{8}$ in. for base; 1 dowel $\frac{1}{4}$ by $1\frac{3}{4}$ in.; 1 pc. lightweight copper 3 by 4 in. for tray; red, blue, yellow, green, black, and white oil colors in tubes (of any inexpensive grade); turpentine for thinning the paints; and walnut wood stain.

The drawings are practically self-explanatory. The deeper parts of the carving are indicated by the heavier lines. In the front and back views, the carved designs are represented on the left, and the completed designs, both carved and painted, are shown on the right. Recess A in the base should have sloping sides

and slightly rounded corners, and recess B must be worked out to fit the pipe it is to hold.

To make the tray, place the copper over depression A and peen the metal into shape; then trim the edges.

After doweling and gluing the parts together, stain the entire assembly walnut and allow it to dry thoroughly. Then paint the base of the totem pole black and color the pole.—HOWARD REID.



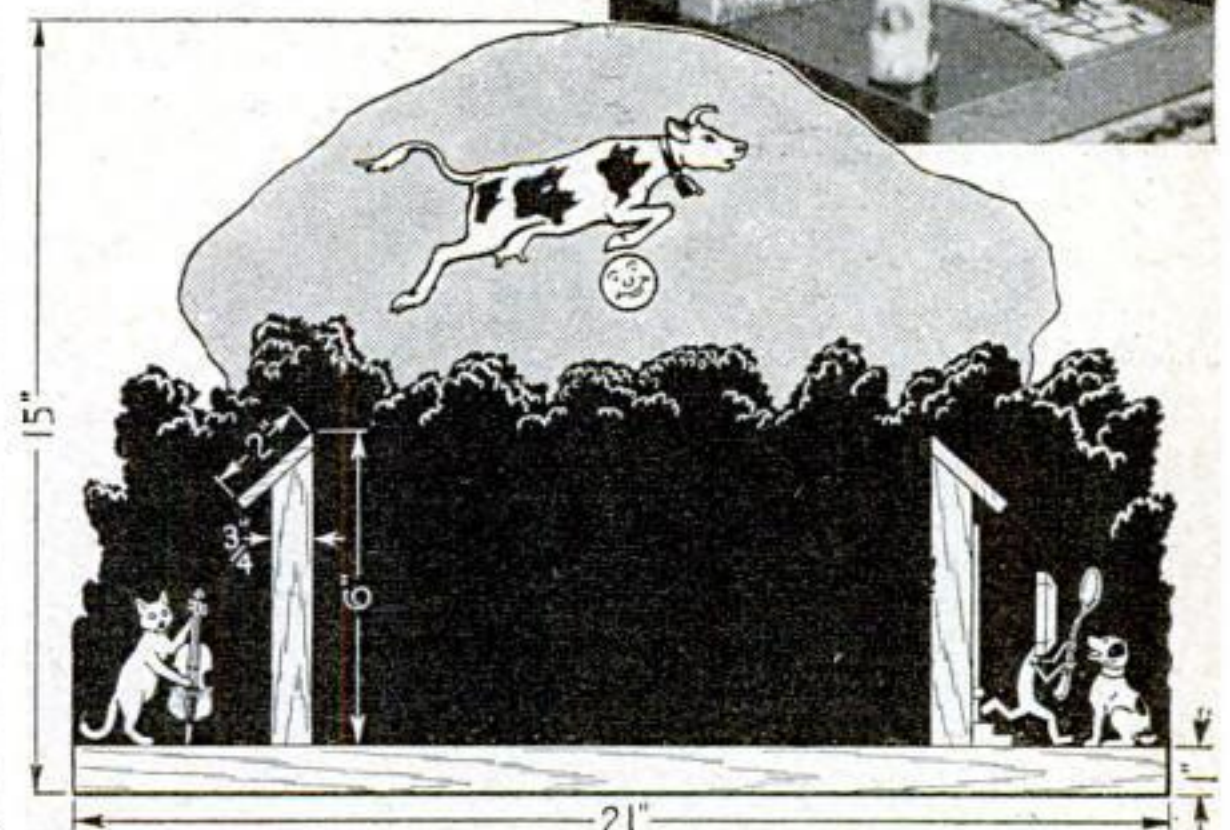
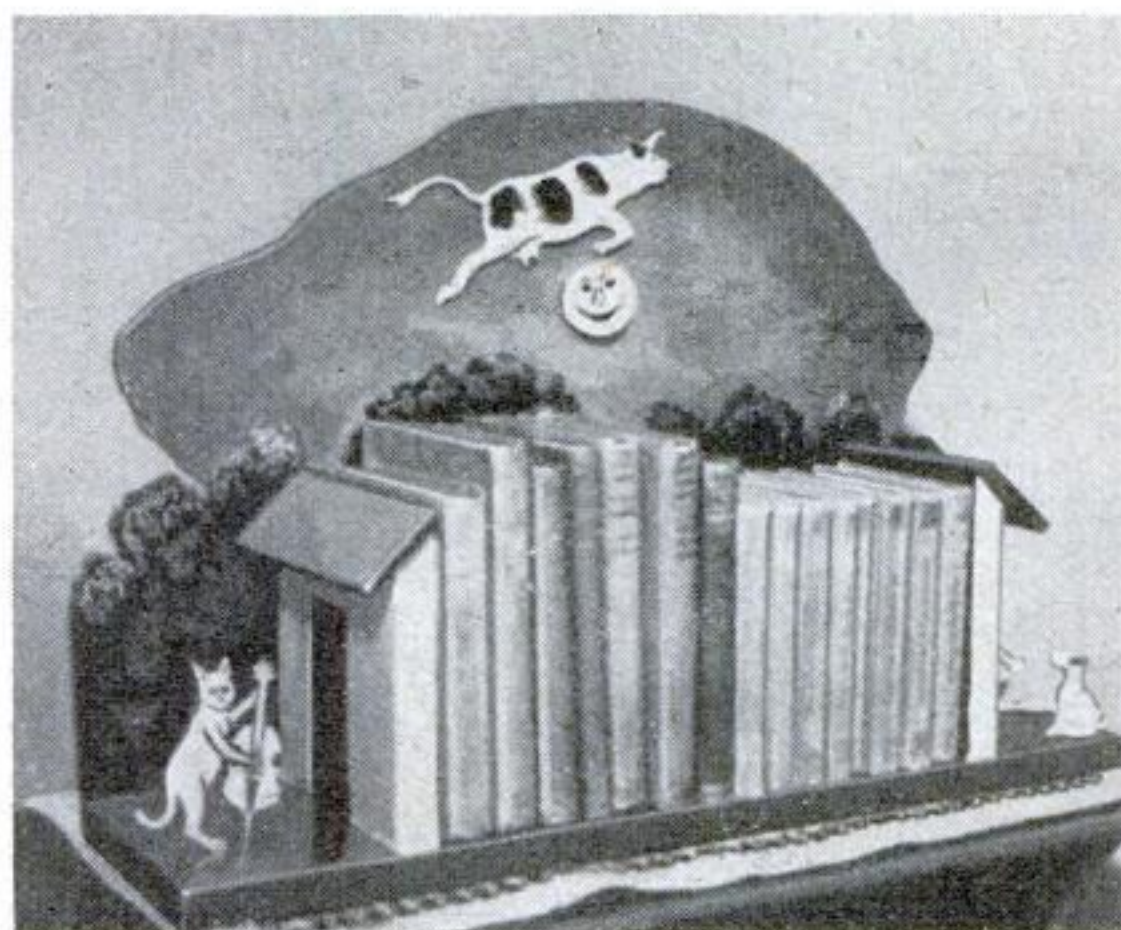
A Child's Nursery-Rhyme Book Rack

THAT must have been a sour note the cat pulled out of the old bull fiddle to make Bossie arch her tail and jump clear over the barn and the moon. The dish on the kitchen table heard it, too, and grabbed his spoon and ran right out of the door. Towser was used to sour notes so he just sat back and had a good laugh at the whole bunch.

You can reproduce this whole nursery-rhyme scene on a child's book rack. The bottom and ends are cut first and assembled with screws. The back is then cut out on the jig saw and nailed in place. The details are added as shown, the animal figures and the dish being jig-sawed from thin wood.

The sky is painted dark

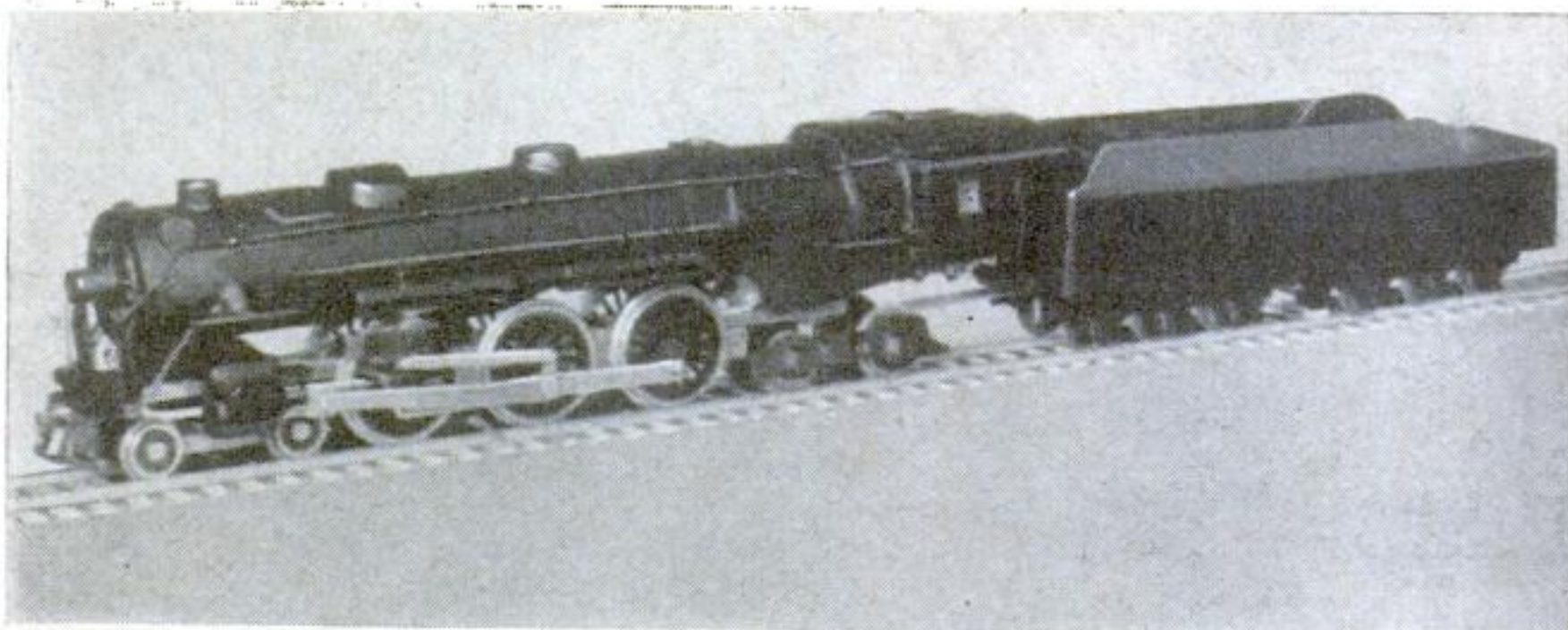
blue blended with light blue around the moon. The moon is yellow with black markings. The cow is black and white, and the trees a very dark green at the top shading into black at the base and lightly tipped with silver on the uppermost leaves. The house and barn are white with dark doors (Continued on page 125)



Left, the complete rack. Above, the front view with main dimensions. Upper right, a close-up of one end

Adding Boiler and Cab

TO OUR NEW Locomotive Model



The finished locomotive and tender are 14 in. long. This is an ideal size because it allows much simpler construction than otherwise would be possible



By HAROLD V. LOOSE

BUILDING the boiler and cab of our new, simplified locomotive model* is about the most absorbing part of the whole job. These elements of the superstructure are the ones that give the steam engine its characteristic shape and make it so much more appealing than a Diesel or electric locomotive.

Most American motive power literally bristles with detail. Domes, handrails, and rows of piping make our engines an interesting contrast to the sleek, smooth locomotives used in Great Britain. The Hudson type is no exception to this rule—in fact, it is covered with so many small outside fittings

that building a perfect scale model is a task only for the experienced model maker. Fortunately, in HO gauge it is feasible to leave off much of the piping and other details without impairing the appearance of the model.

Construction begins with the boiler, which is a piece of 1-in. brass tubing, 4 11/16 in. long. After squaring the ends off with a file, mark four center lines at top, sides, and bottom to aid in keeping everything in line when the details

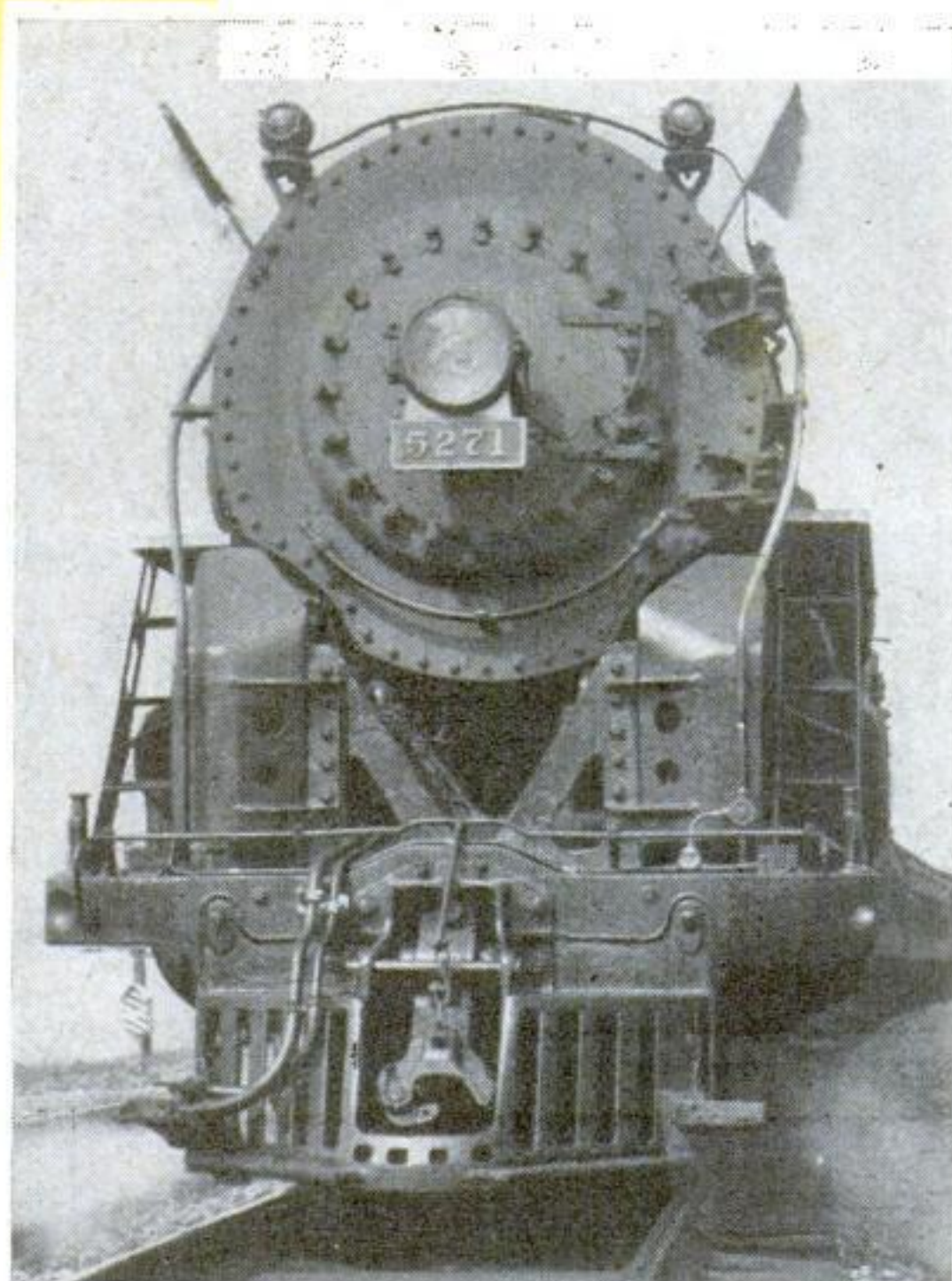
are added. In the bottom at the rear end, cut a slot 3/4 in. wide and 1 1/2 in. long. This provides clearance for the transmission gears.

The next parts to add are the stack, feed-water heater, steam dome, and sand dome. The first is a bit of tubing filed to fit the contour of the boiler, while the second two are brass rod. The sand dome is made by taking a length of 1/8 by 1/2-in. brass bar, heating it red hot, then quenching in water. This makes it soft so it can be bent to fit the boiler, after which it is filed to shape.

All these parts are soldered on, and should be added before doing any other work on the boiler, because, being large, they call for a lot of heat in soldering, and this heat would cause other details, if present, to melt off. Build up a neat fillet of solder around the base of these parts, and when the job is finished, use an old file to clean off any excess.

As mentioned in the preceding article, the soldering work on this locomotive calls for a good-sized soldering iron and plenty of heat. Soldering paste of the noncorrosive type should be used; and, of course, all surfaces must be cleaned if the liquid metal is expected to stick to them. It is a good idea to have a pot of water on hand, and when a part has been soldered, to dip the whole boiler so as to cool it. This keeps it from getting too hot to handle. If any trouble is experienced through some parts melting off while the others are being soldered, wrap those first soldered in a damp rag. This keeps them from getting too hot.

The fire box and cab parts are cut from thin sheet brass. Do not use sheet iron for these parts, as the fer-



"Prototype" is what a model maker calls the original of his model, and here's ours—a Hudson-type locomotive

*Complete instructions for building the locomotive frame and running gear, accompanied by full-size drawings, were given in the preceding issue (P. S. M., Nov. '37, p. 89.)

The coupler is a commercial article, although you can file up a dummy from brass, if desired. It is pivoted on a small escutcheon pin. The real Hudson locomotives have a front coupler that drops down flush with the outside of the pilot when not in use. If your model is not intended for actual running, you may wish to put the coupler in this position.

The lugs are made from model-railroad track spikes inserted into holes drilled in the head and soldered from the back, while the headlight is a piece of brass tubing. If you want a working headlight, there is plenty of room in the boiler for a flash-light bulb. It can be wired directly to the third rail, or batteries may be carried in the tender.

The two air reservoirs are soldered to the left side of the boiler, and consist of lengths of $\frac{1}{4}$ -in. brass rod. Some Hudsons have one tank on each side; others have this arrangement, so you can take your choice.

brace them with little L-shaped strips of brass, if desired, but this is not altogether necessary. Note the steam pipes on each side just below the stack. They should be made and fitted individually.

A pair of ladders run from the forward ends of the running boards to the pilot beam. They are made of standard model builder's ladder strip, but if you prefer, you can solder them up from wire. The handrails are wire, and are supported on small lills (pins) soldered into holes in the boiler.

The motor shown in the drawing is of the permanent-magnet type developed especially for HO gauge. This type of power unit is preferable to the ordinary series-wound motor since it can be reversed at any time simply by changing the direction of the current supply. This is important in model railroading, because when a locomotive is equipped with a permanent-magnet motor, it can be reversed from the panel board at will, no matter what part of the track it is on.

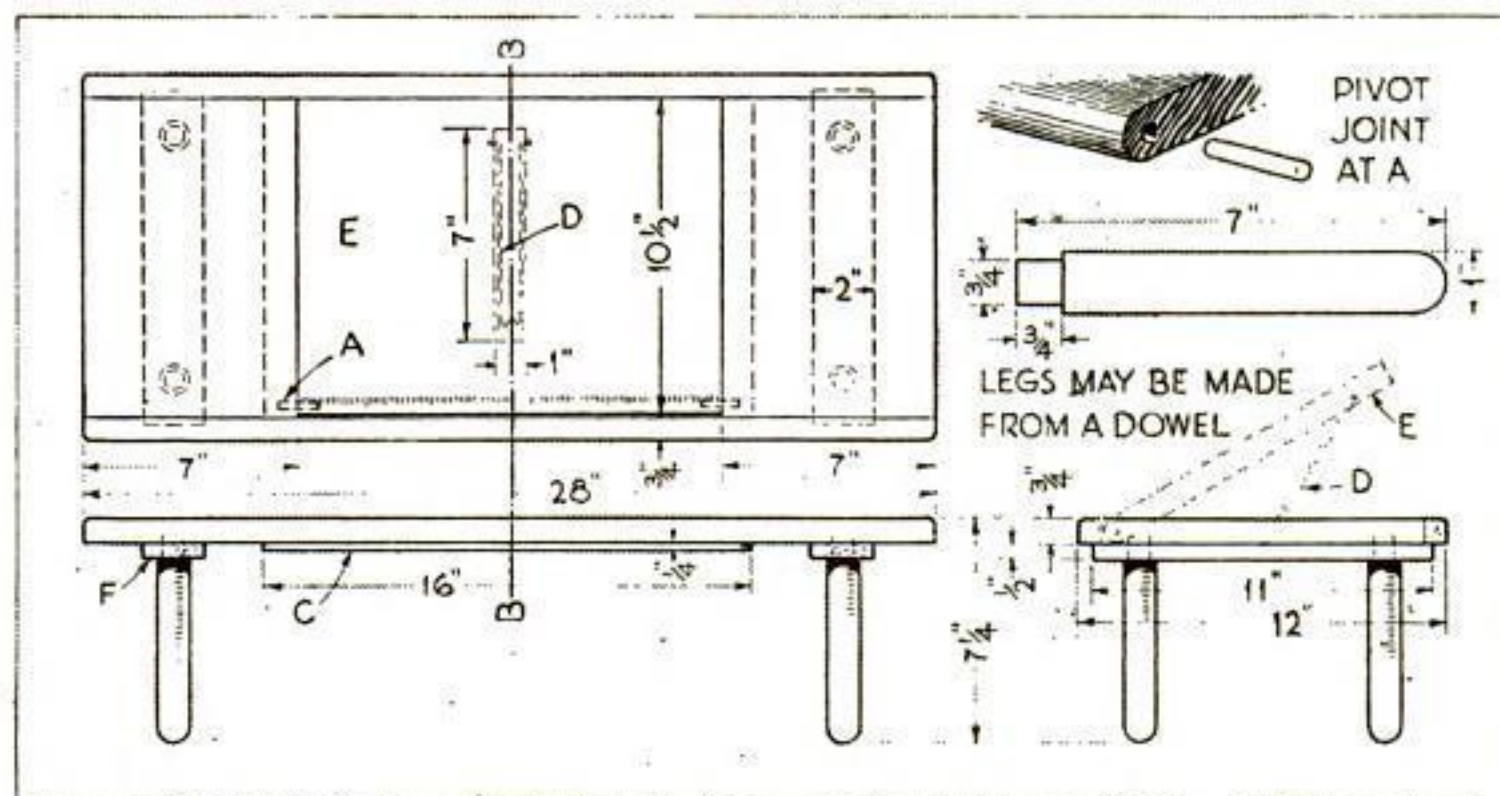
The current required is six volts, direct current. This is preferably obtained from a storage battery. It need not be a new unit—a battery too far gone to use in an automobile will serve very well. If you prefer to obtain current from the house supply, use a transformer of the type sold with toy trains, and change the alternating current to direct current with a heavy-duty copper-oxide rectifier, which may be obtained from a radio-supply house. For occasional operation, power may be obtained from four dry cells which are wired in series.

Inexpensive Bed Table

HAS DETACHABLE LEGS

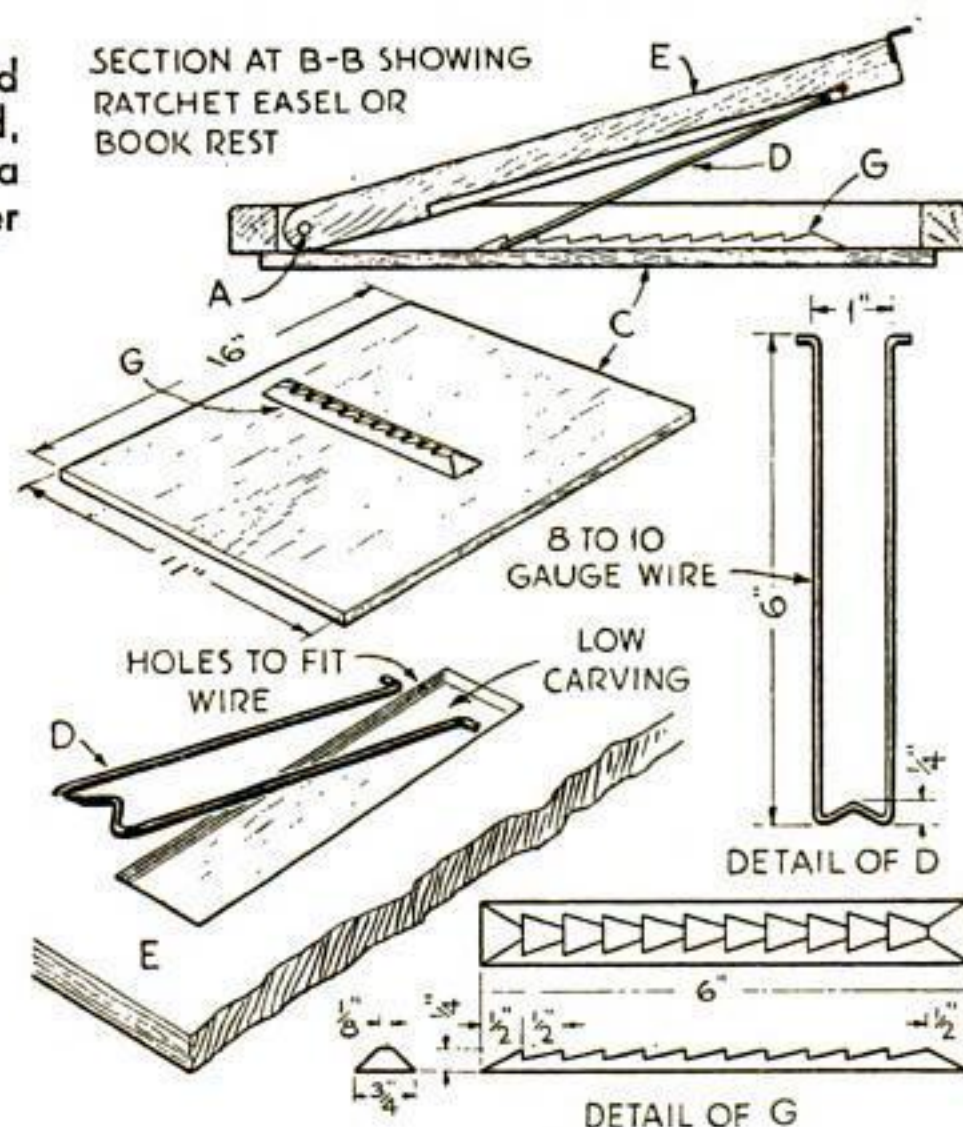


For reading or serving meals in bed, the table is a convenience, especially in case of illness



The table is enameled and trimmed, if desired, with tinted edges or a flower design in center

SECTION AT B-B SHOWING RATCHET EASEL OR BOOK REST



LIST OF MATERIALS

Pc.	Description	T.	W.	L.
2	Sides— pine or birch	$\frac{3}{4}$	$\frac{3}{4}$	28
2	Ends " " "	$\frac{3}{4}$	$10\frac{1}{2}$	7
1	Top (E) " " "	$\frac{3}{4}$	$10\frac{1}{2}$	14
2	Cleats (F) " " "	$\frac{1}{2}$	2	11
1	Bottom (C)— pine or fir plywood	$\frac{1}{4}$	11	16
1	Ratchet (G)— maple or birch	$\frac{1}{4}$	$\frac{3}{4}$	6
4	Legs—pine or birch	1	dia.	7
1	Easel (D)—wire	$\frac{1}{8}$	"	15
2	Pivot pins (A)—wire	$\frac{1}{8}$	"	$1\frac{1}{2}$

NOTE: All dimensions are given in inches.

snug fit so no glue is required. Finish with one undercoat and two coats of light enamel.—F. CLARK HUGHES.

CUT the pieces for the table top to shape and chisel a depression in the back of the middle section for the easel leg. Assemble by placing two $\frac{1}{8}$ by $1\frac{1}{2}$ -in. pivot pins at A to hold E in position, and glue the two sidepieces to the end sections. Nail C to the underside of the table. Cut G from hardwood and glue to the top of C to match the depression in the back of E. Bend D from 8- or 10-gauge brass or galvanized wire and mount as shown.

Use large dowels or broomsticks for the legs or turn them in the lathe. Screw the cleats in place and bore holes through them for the legs, extending the holes $\frac{1}{4}$ in. into the top. Make a

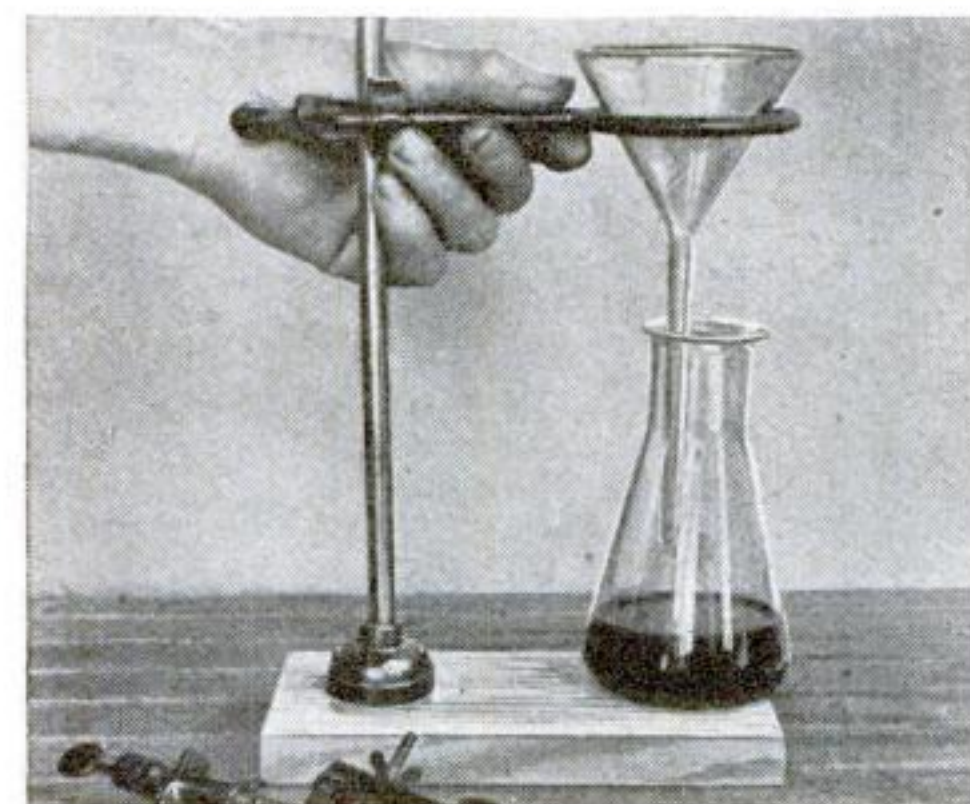
An Aluminum Lamp for Power Tools

A LAMP that will throw a bright light on the work, yet leave the eyes in shadow, is a necessity for power tools, especially those used a great deal at night, as is the case with the machines in the average home workshop. If yours are not already so equipped, a home-made lamp like that illustrated is easily attached and throws a brilliant spot of light right where you want it.

Buy a ten-cent aluminum measuring cup and cut a hole in the bottom for the mouth of the lamp socket, which should have a nicked shell, to harmonize. An easy way to do this is to improvise a tool as shown in the circle. The cutter is made from a heavy needle, and a bolt keeps the wooden block centered.

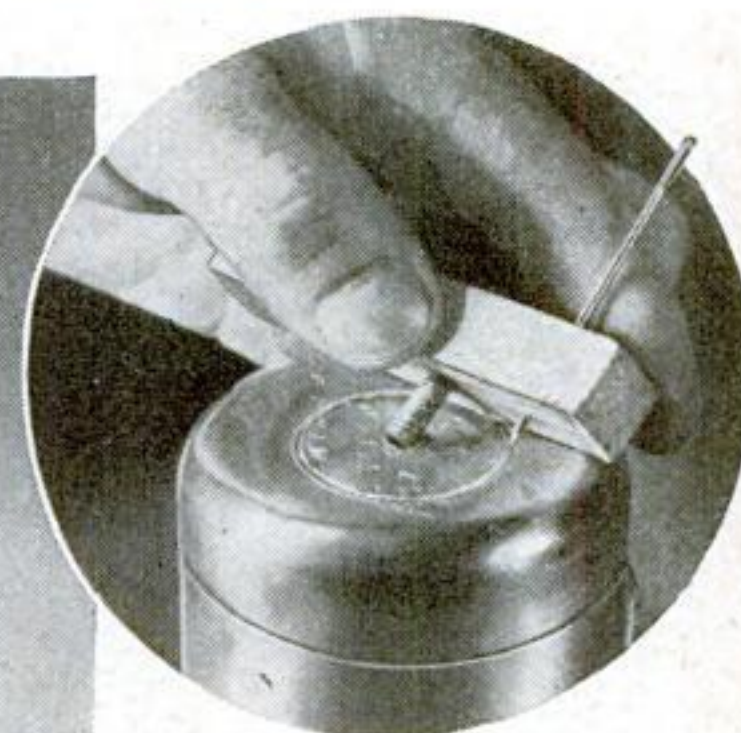
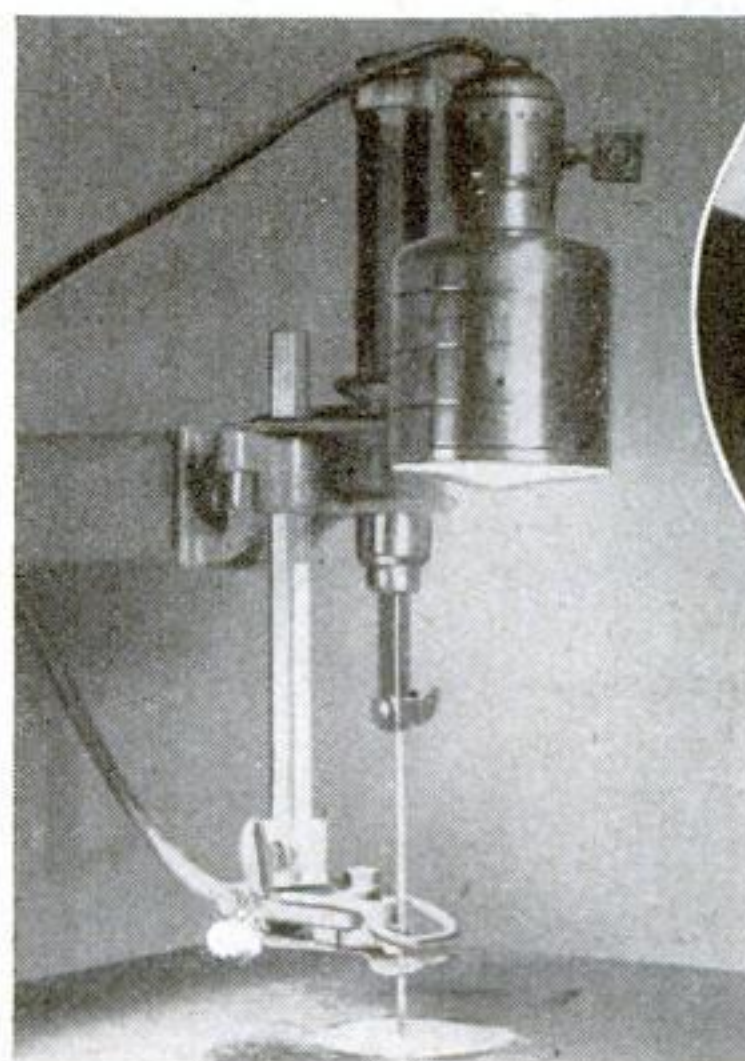
In place of the wooden handle of the cup, if it has such a

handle, substitute a small metal tube. The end of this tube can be slipped over the metal part of the handle, which is riveted to the cup. The tube then can be attached to the power tool by any convenient method, such as that shown, so that it can be moved about within a limited circle.—K. M.



Lamp-Socket Caps Used as Floor Flanges

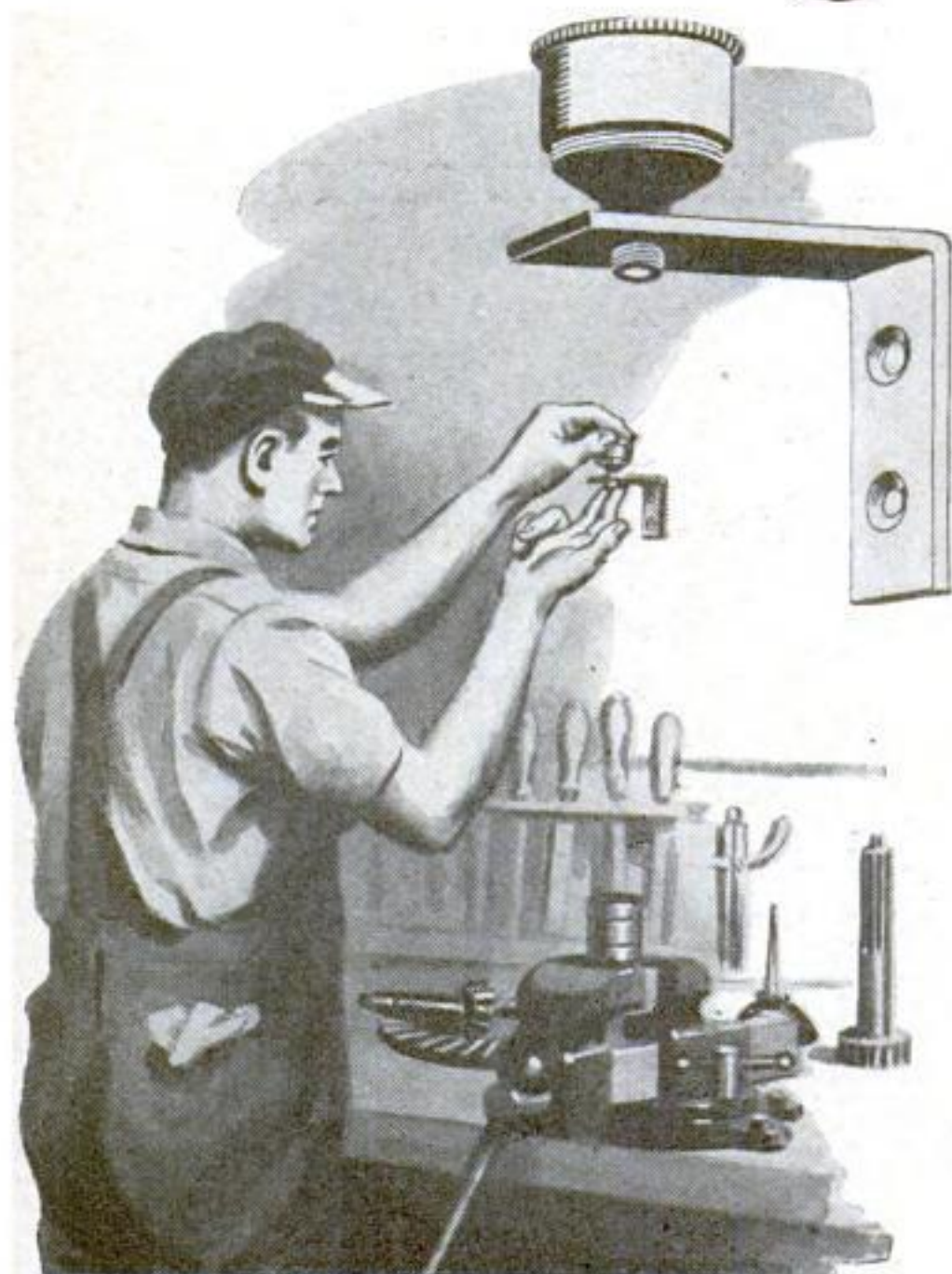
FLOOR flanges for mounting $\frac{1}{8}$ -in. iron pipe on wooden bases may be improvised from the caps of old lamp-socket shells, which are already threaded. Screw the pipe into a cap and clamp it in the vise with the cap uppermost. Plug the pipe with a bit of wood and fill the cap with melted lead. Then drill two or three equally spaced holes at an angle through the flange for the mounting screws.—W. C. W.



The lamp attached to a jig saw. The hole in the measuring cup, which forms the shade, is made with the improvised circle cutter above

SHOP HINTS

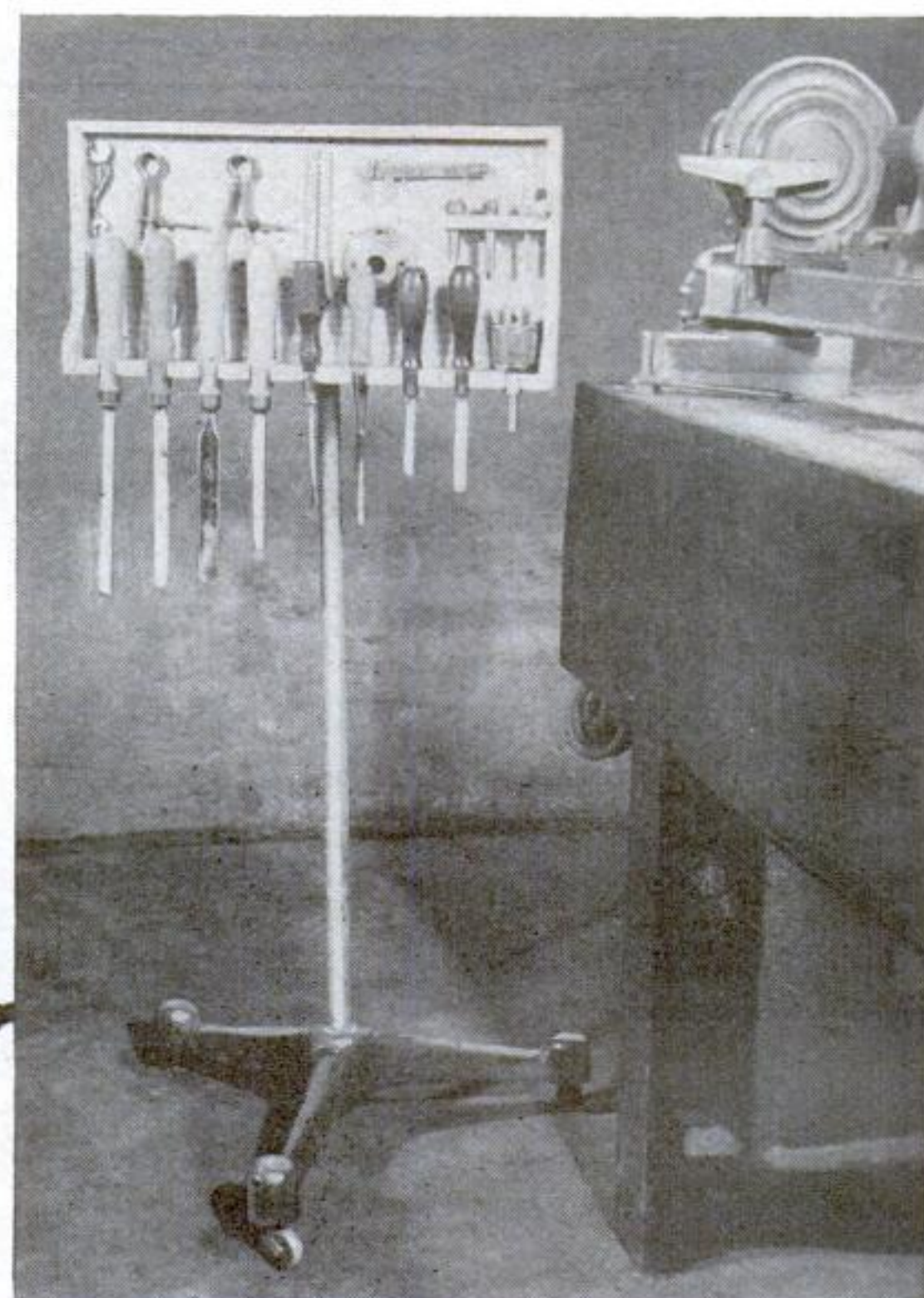
Movable Rack for Wood-Turning Tools



WOOD-TURNING chisels and small accessories are usually kept in a rack or a cabinet on the wall of the shop. This is a neat and convenient arrangement if the lathe itself is placed nearby against the wall, but when, as not infrequently happens, the lathe is set up on a bench away from the wall or in some other location where such a rack cannot be used, it pays to make a movable stand of the type illustrated. This can be wheeled right up to the lathe, yet moved out of the way when not in use.

The accessory board is 10 by 20 in., and the overall height is

43 in. Two kinds of base are shown. One was taken from a discarded dry-goods store cloak rack; the other was made of wood.—LOUIS A. LEMBACH.



The stand is wheeled up to the lathe when needed. The base at left is made of wood; the one above was taken from a discarded cloak rack

Prussian Blue Stored in Old Grease Cup

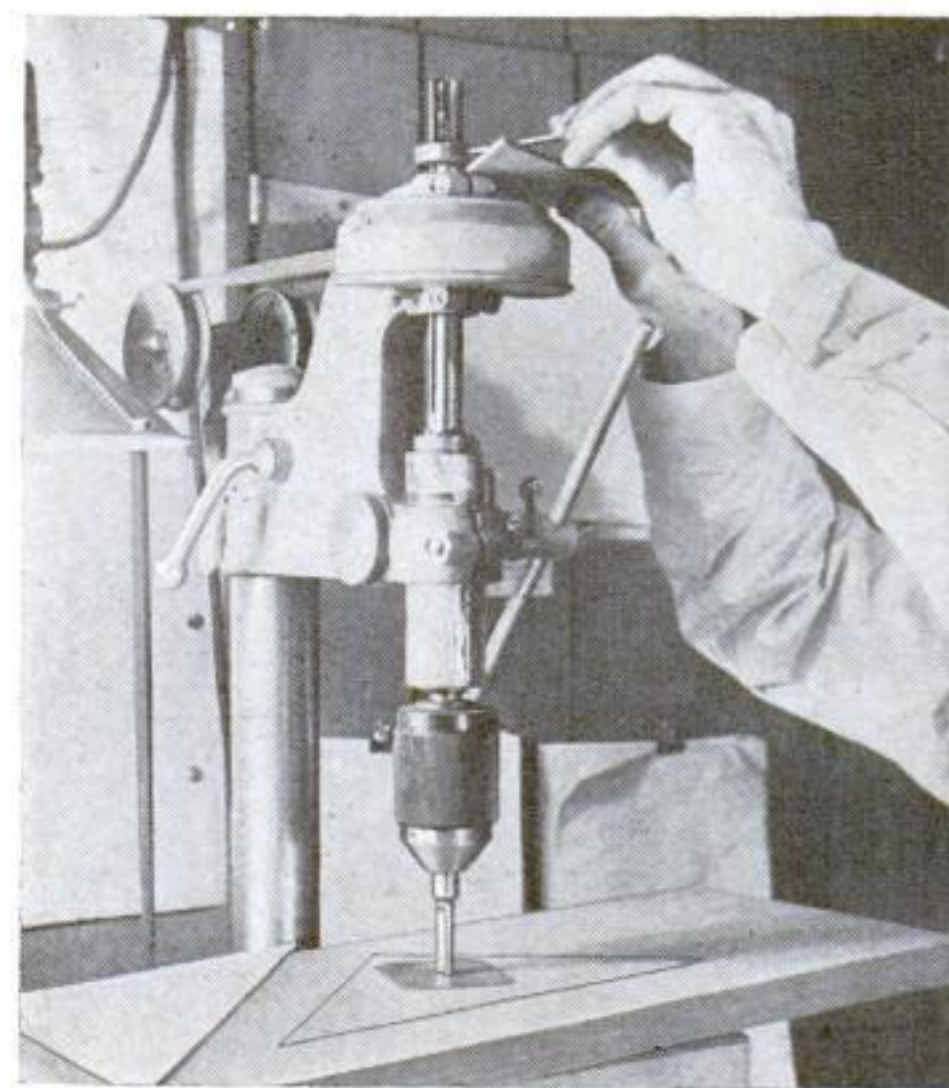
PRUSSIAN blue, which is used so frequently in the machine shop, can be kept handy in a dispenser made from a $\frac{1}{4}$ -in. grease cup and a piece of 2 by 2 by $\frac{1}{8}$ -in. angle iron. One leg of the angle is drilled for wood screws, and the other is drilled and tapped to take the grease cup. A good place to fasten the dispenser is over the workbench as shown above.—GEORGE MILLER.



Pit Dug to Aid in Welding Big Gears



A HOLE dug in the ground, with I-beams around the top, speeds up the rebuilding of teeth on heavy gear sections and similar parts of machinery. As the welding proceeds, the piece is lowered with a chain hoist. To save having to lower the work at too frequent intervals, the welder's seat is given a wide range of adjustability. It is supported on the end of a section of 3-in. pipe, fitted horizontally to a vertical section of 8-in. pipe by a collar and set screw so the seat may be moved vertically or horizontally. A small timber under a gear tooth serves to steady the work. The teeth are finished with a grinder on a flexible shaft.—J. C.

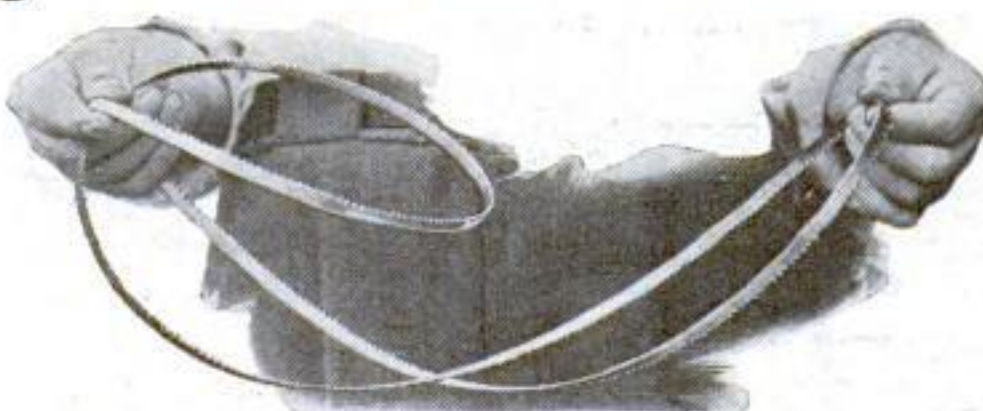


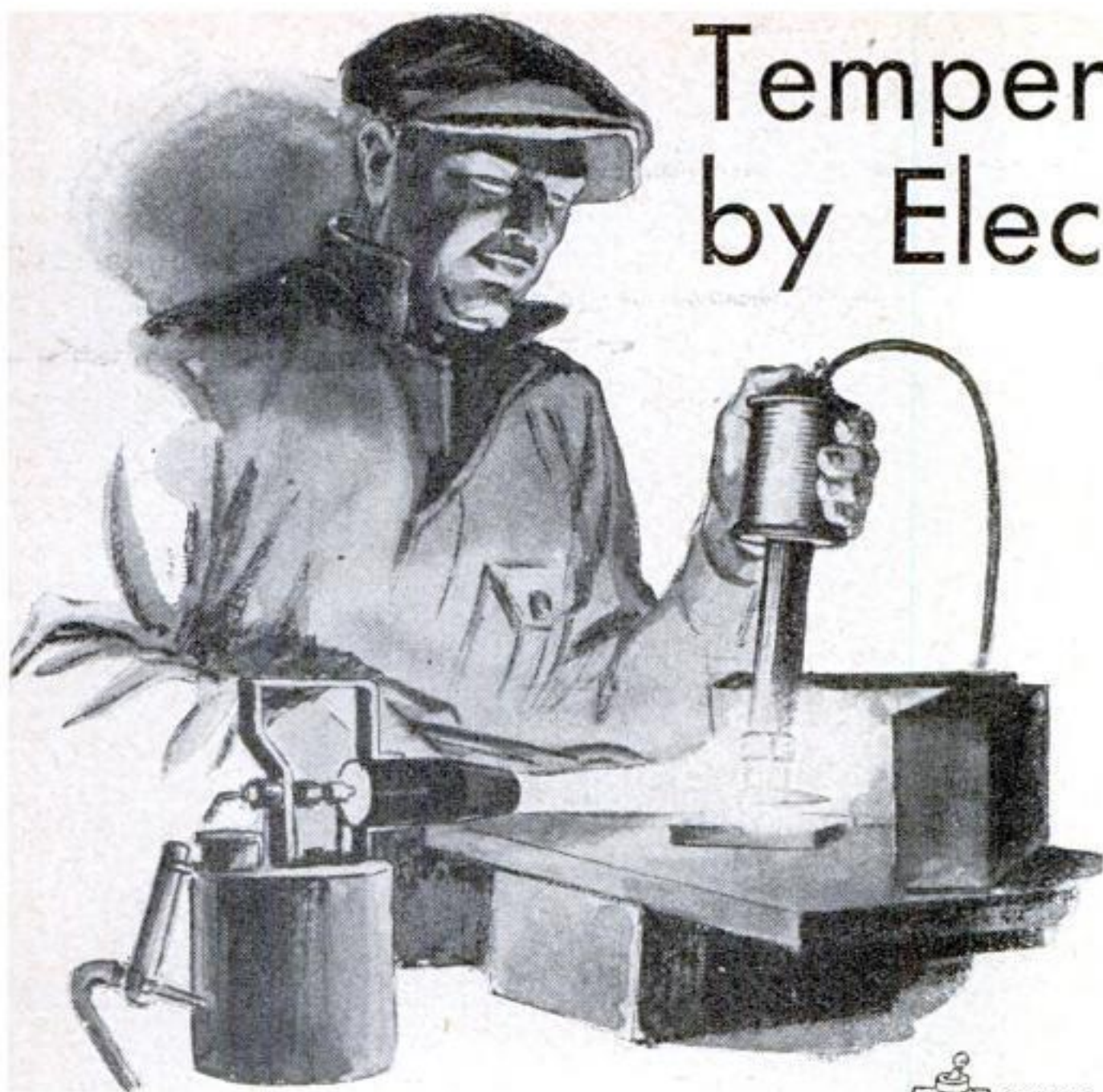
Setting Router Bit to Cut Grooves for Inlays

WHEN using a router bit on a drill press to rout out work for inlays of a certain depth, simply bring the router bit down on top of a piece of tin set on the work and use a piece of the wood to be inlaid as a guide for setting the depth gauge as shown above. The tin is used so that the inlay will project slightly for sanding.—THOMAS B. OWENS.

The Trick of Unfolding a Band-Saw Blade

BAND-SAW blades, large or small, can be unfolded easily and safely by grasping the proper loop as shown at the right. As the saw is always under control when this method is used, it will not tangle or spring apart suddenly and scratch you.—ROBERT PUTZER.



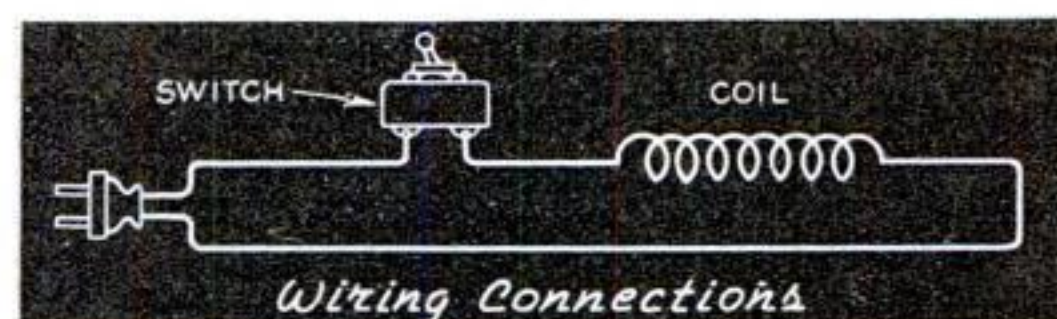
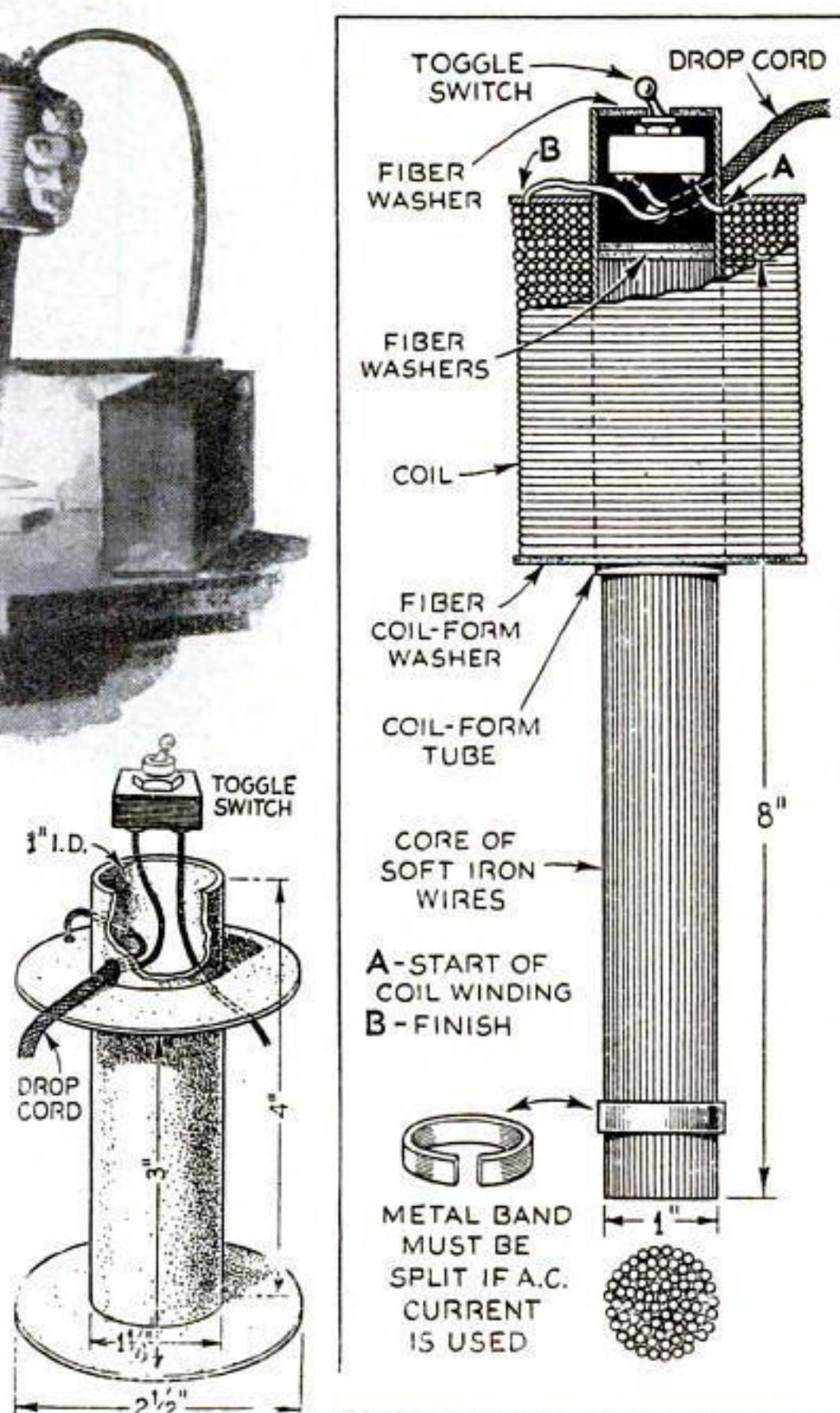


Tempering Aided by Electromagnet

THE correct temperature at which to quench steel during the tempering process may be determined easily with the aid of an electromagnet made as shown. The tool is brought slowly to a red heat and the end of the electromagnet is touched to the cutting edge. When the temperature has been raised to the point where no magnetic attraction is evident, the tool has reached the critical point and is quenched at once in clean, cold water. It is then reheated and drawn in the usual way.

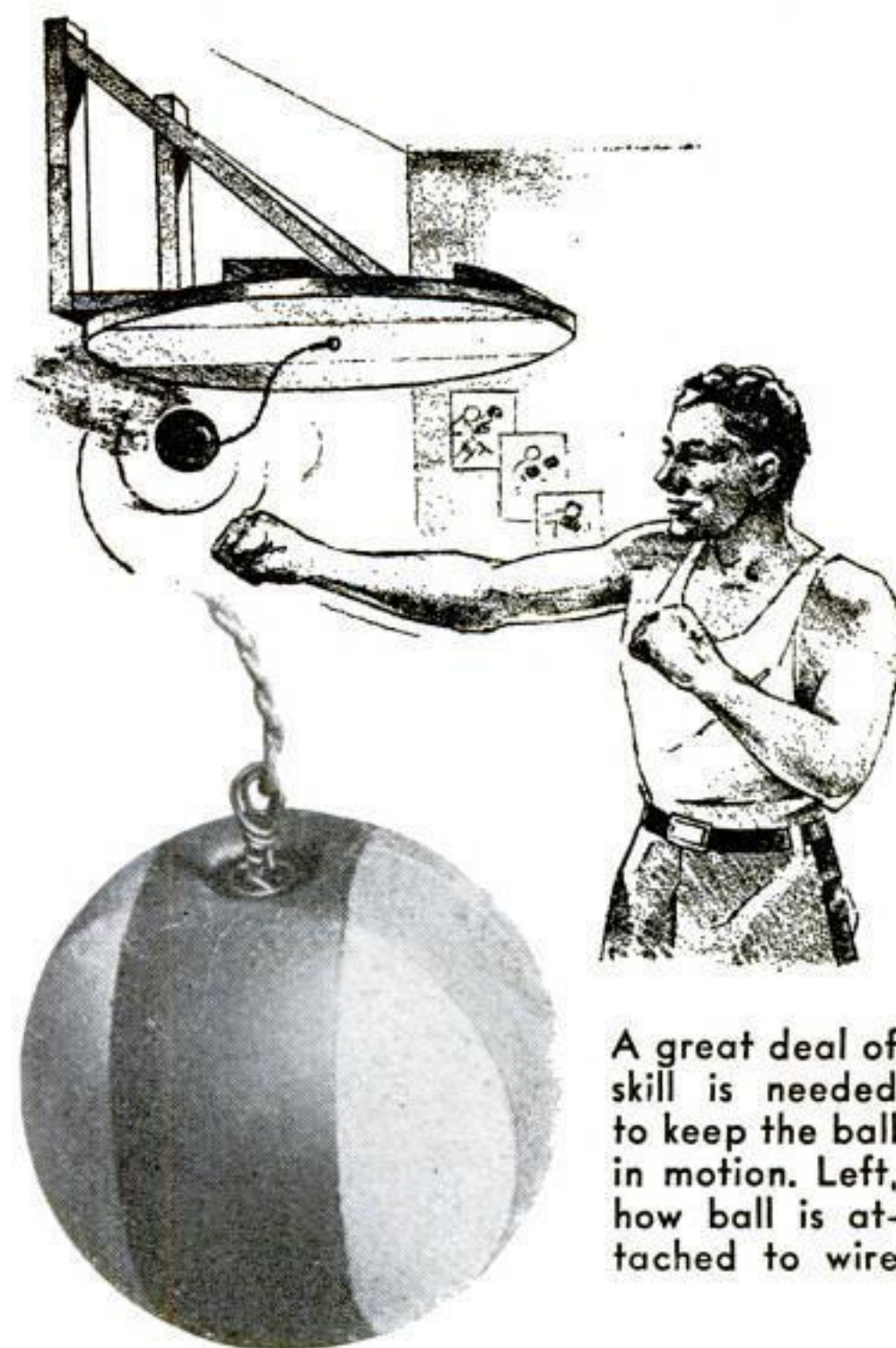
This tester is much better than a permanent magnet for the purpose because it never loses its strength and, since it has a laminated core, transmits heat slowly. In fact, the end of the core may be placed directly in the fire for a long enough time to make the test. The tool also has other uses, such as removing iron or steel chips from drilled holes, retrieving nuts, washers, and other small parts that have fallen into inaccessible places, and holding small parts in position for assembly.

The core is merely a bundle of soft iron wires of small diameter, although thin strips of sheet iron may be used if preferred. The coil form is made as shown from fiber. The shell of a burned-out 100-ampere cartridge fuse is just the right size for the tube. The coil-retaining washers are cut from 1/16-in. fiber board, pressed into position, and given several coats of shellac. A



toggle switch is placed in the top of the tube and held with shims of sheet fiber, dipped in shellac. Before this is done, however, the coil is wound in even layers. For 110-volt alternating current, use 1 1/4 lb. single cotton-enamel wire, and for 6-volt battery operation, use 2 lb. of No. 16 single cotton-enamel wire.

After the connections have been made and the switch inserted, several fiber washers are pushed into the tube to protect the wires and the bottom of the switch, and the core of soft iron wires is then forced into the tube. A metal band holds the wires together near the end, and it must be split as indicated if alternating current from a light socket is used.—W. C. CHENEY.

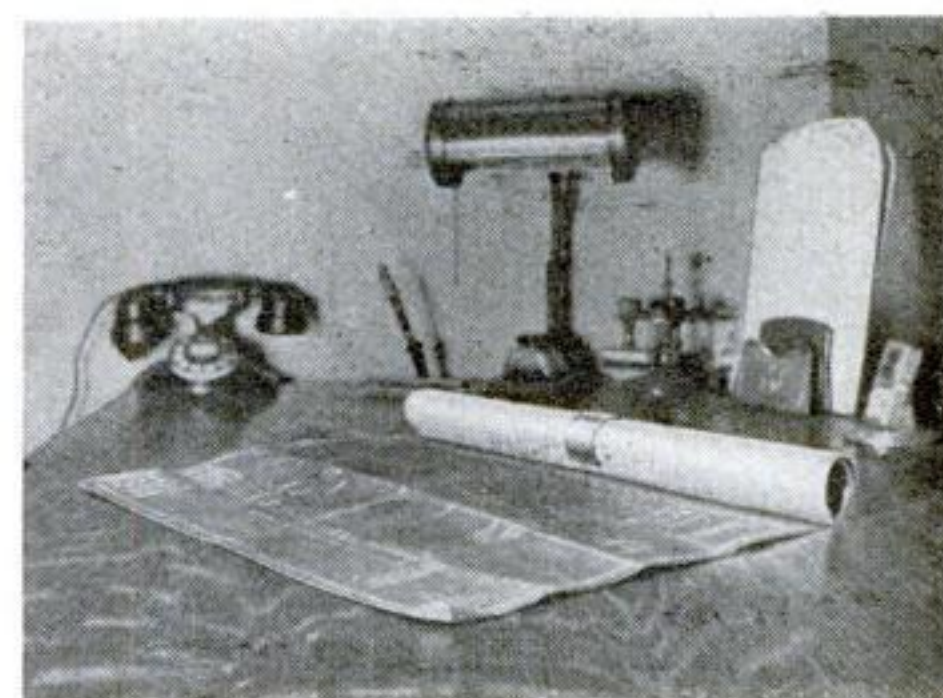


A great deal of skill is needed to keep the ball in motion. Left, how ball is attached to wire

Small Striking "Bag" Made from a Ball

INEXPENSIVELY made of scrap lumber and an ordinary sponge-rubber ball, this striking "bag" is a good imitation of the real thing. The ball is light but quite fast, and its small size makes it harder to hit, so that considerable skill is needed to keep it in motion for more than a few seconds at a time.

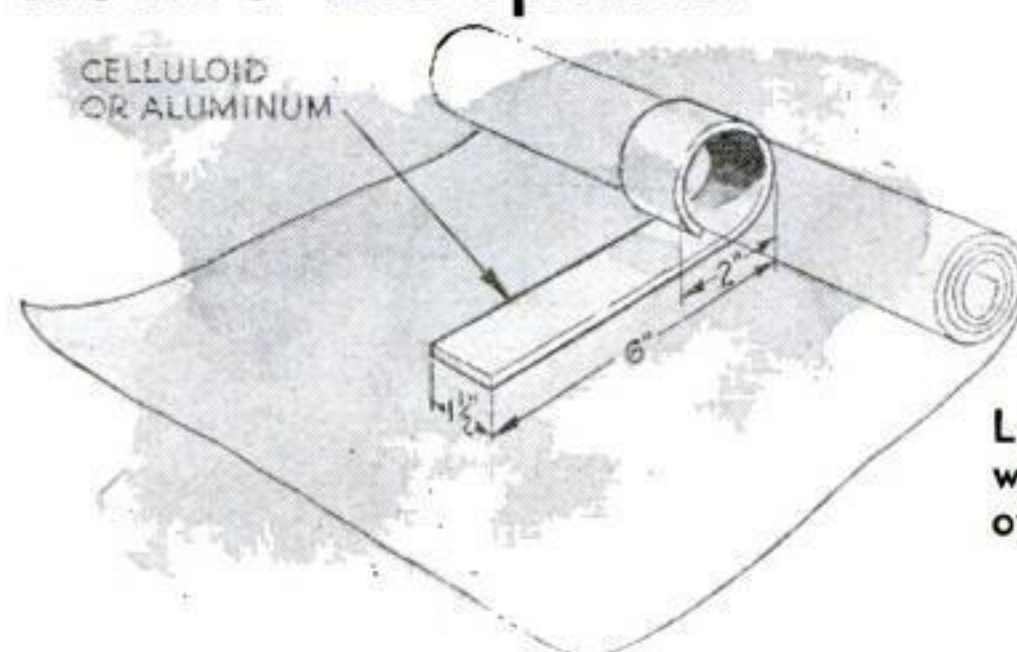
The platform is a 2-ft. disk of wood, the thicker the better, supported by two right angle brackets fastened to the wall. To attach the ball, first punch a hole through its center with a large nail. Bend double a piece of stiff wire about 1 ft. long, thread the free ends through diagonally opposite holes in a metal button or small metal disk, through the hole in the ball, and through the holes in another button; then twist them tightly together, pressing the buttons well into the soft rubber. Bend the ends of the wire around a nail and wrap them several times around the first twist, to form a small loop. Suspend the ball by a piece of light but strong cord from a short link of stiff wire threaded through a screw eye in the center of the platform as illustrated above.—GUY A. RAFUSE.



Large blueprints are easily kept unrolled with this simple holder made from a strip of aluminum or celluloid curved as shown

Holder for Using Rolled Blueprints

A HOLDER made as shown from a strip of aluminum or celluloid 1 1/2 in. wide and about 9 in. long is a convenience in consulting rolled-up blueprints. The roll is inserted in the circular end of the holder and one edge is pulled out as far as necessary. A single weight at the edge will then hold the print flat on the table or bench. The size may have to be changed to accommodate large blueprints.—H. R. WALLIN.



SANTA CLAUS
BRINGS A

TABLE-and-CHAIR

By

REGINALD O. LISSAMAN



the average home furnishings.

Wherever possible, prepare all machined parts of a project first, before making the parts that require less work. In this way minute errors in scaled sizes will become of less consequence. For example, the two back legs of each chair are first to be cut to shape, dressed and squared up ready for joint making, then laid aside; next, the top cross member of the back, and finally the lower two to match. With the front portion of the chair, turn the legs, next the lower spindle, and then make the upper cross rail to match the spindle length. While at the lathe, the lower side spindles may also be turned out. Turn them very slightly longer than shown.

Make all joints, and try the fit of front and back portions of the chair. When you have the back assembled for trial, measure the length of, turn, and place the three small back

spindles. Lay out on cardboard a full-sized plan of the seat for setting the bevel gauge so the shoulders of the tenons on the side rails may be marked. Remember to make these in pairs. If you are doing the mortising by hand, cut out the seat plan and use it as a guide when boring for the tenon pockets in front and back legs.

Plane the upper portions of the legs as shown to give the appearance of tapering. Round the upper ends of the back uprights. Then thoroughly clean up all parts. Assemble and glue the front and back as separate units, and the next day complete the job. Remove all surplus glue from the joints as soon as the work is clamped.

The seat proper is formed from a

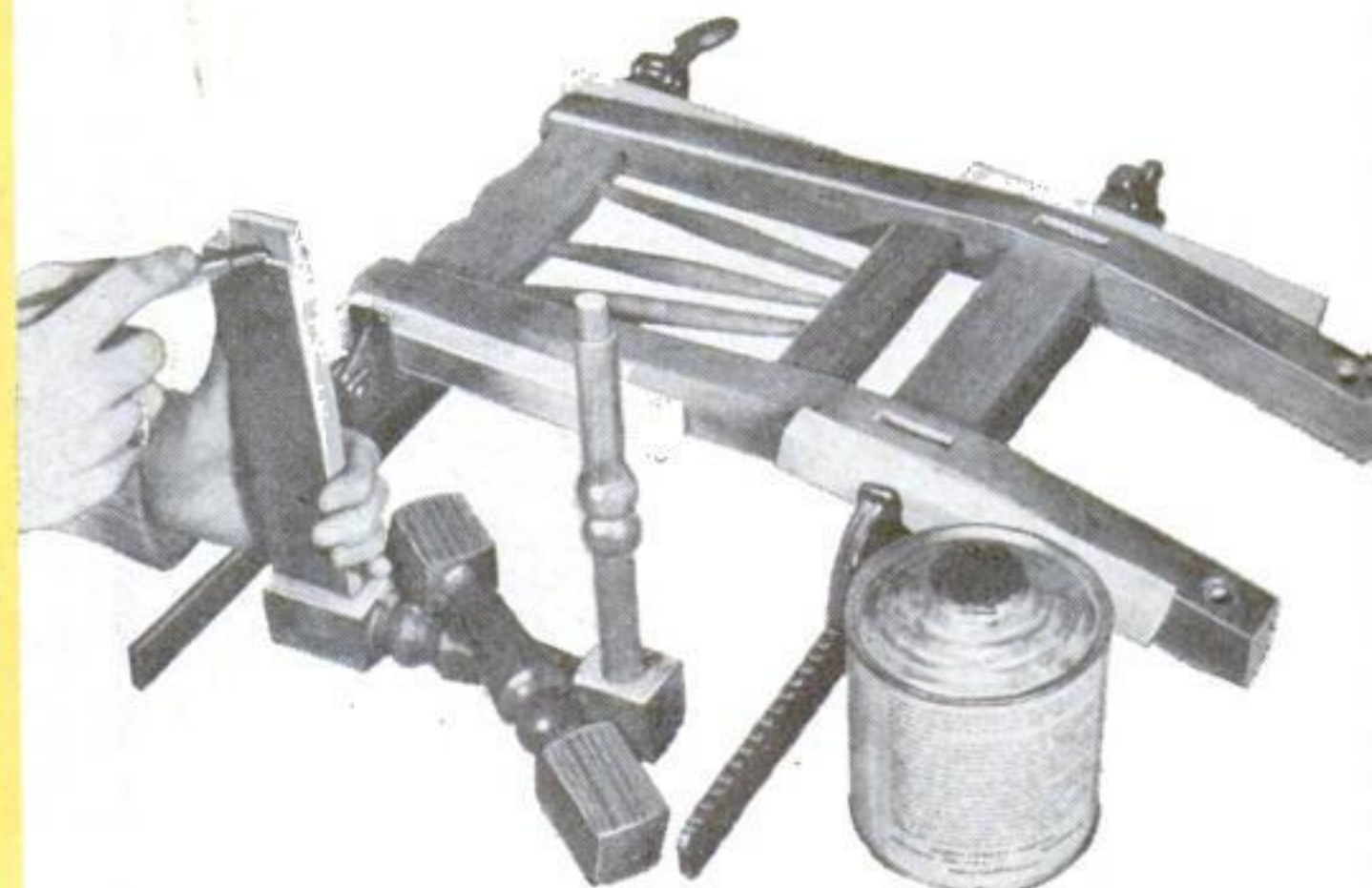
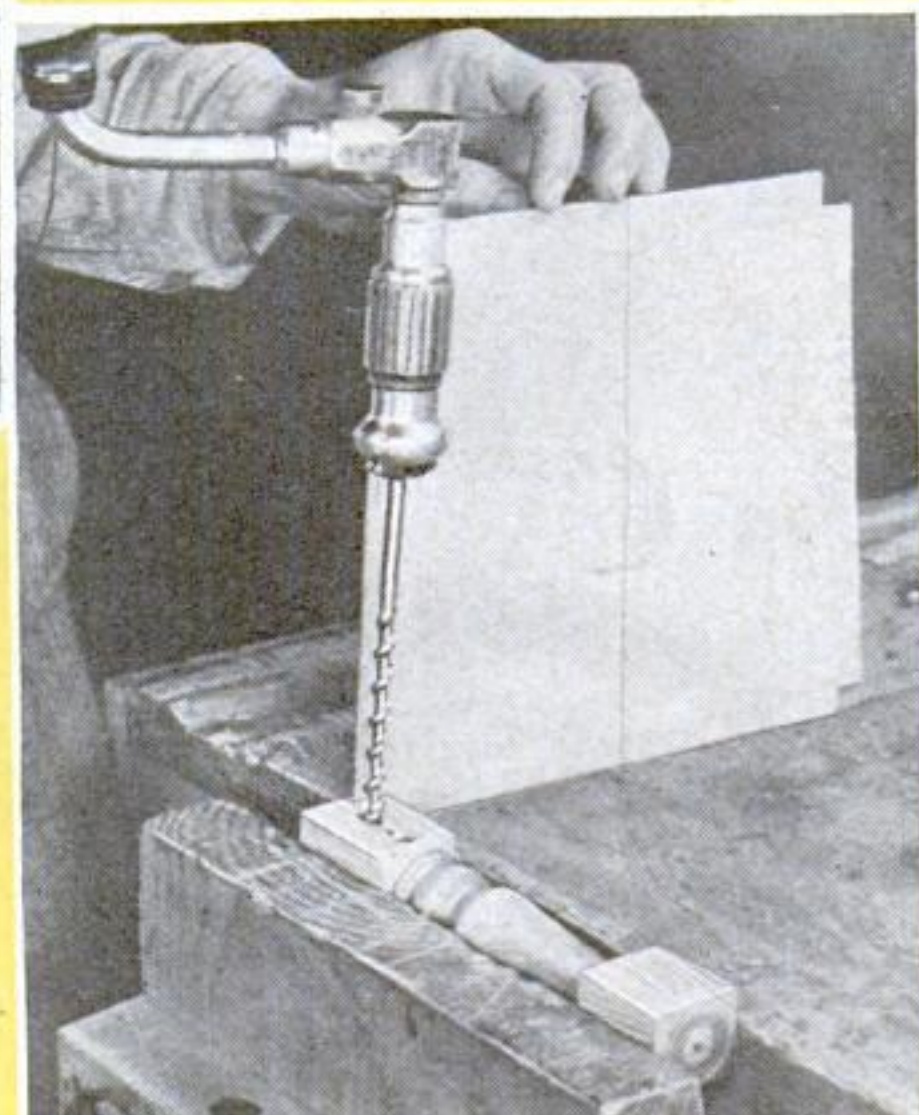
SO WELL designed and attractively finished is this set of children's furniture that after Santa Claus delivers it on Christmas Eve, it may be left permanently in the living room without being unsightly or conspicuous. Few pieces constructed by the writer have, indeed, aroused so much admiration among his friends as the little chairs of this set.

Walnut, or red gum stained walnut, is excellent. Quartered oak, while possessing extreme durability, would not perhaps blend so well with

First sawed as above, the top crosspiece of the chair is then cut to a decorative curve



Sanding a chair leg. It is given a final polish with the back of the paper. At right, using cut-out pattern for seat as a guide to aid in boring holes at the correct angle for the mortise to be cut in the chair leg



The back and front sections are glued first. Notice the counterbored holes in the rear legs for the bottom spindle

SET for the Children

piece of 1-in. pine or other soft-wood cut to fit the seat frame but small enough so the leather covering may be tacked all around the edges. Two or three plies of heavy cloth are laid on the board before covering it with the leather. Place the seat battens in such a manner as to raise the seat surface about $\frac{3}{16}$ in. above the surrounding frame. The seat is held with thin screws through the battens from underneath. Let it remain loose, however, until the frame has been stained and finished.

The table is a straightforward piece of work, and it is necessary merely to follow the drawings. Square up and dress all legs before turning. The turned lower spindle, which matches the spindle at the front of the chair, may be turned from a $1\frac{1}{4}$ -in. square piece if you first glue material around it at the middle from which to turn the raised beads.

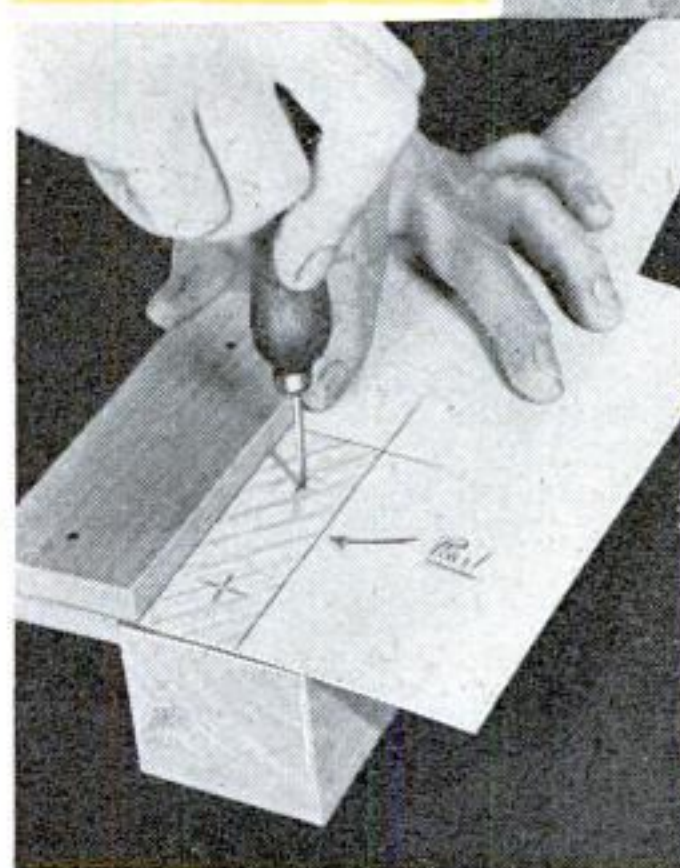
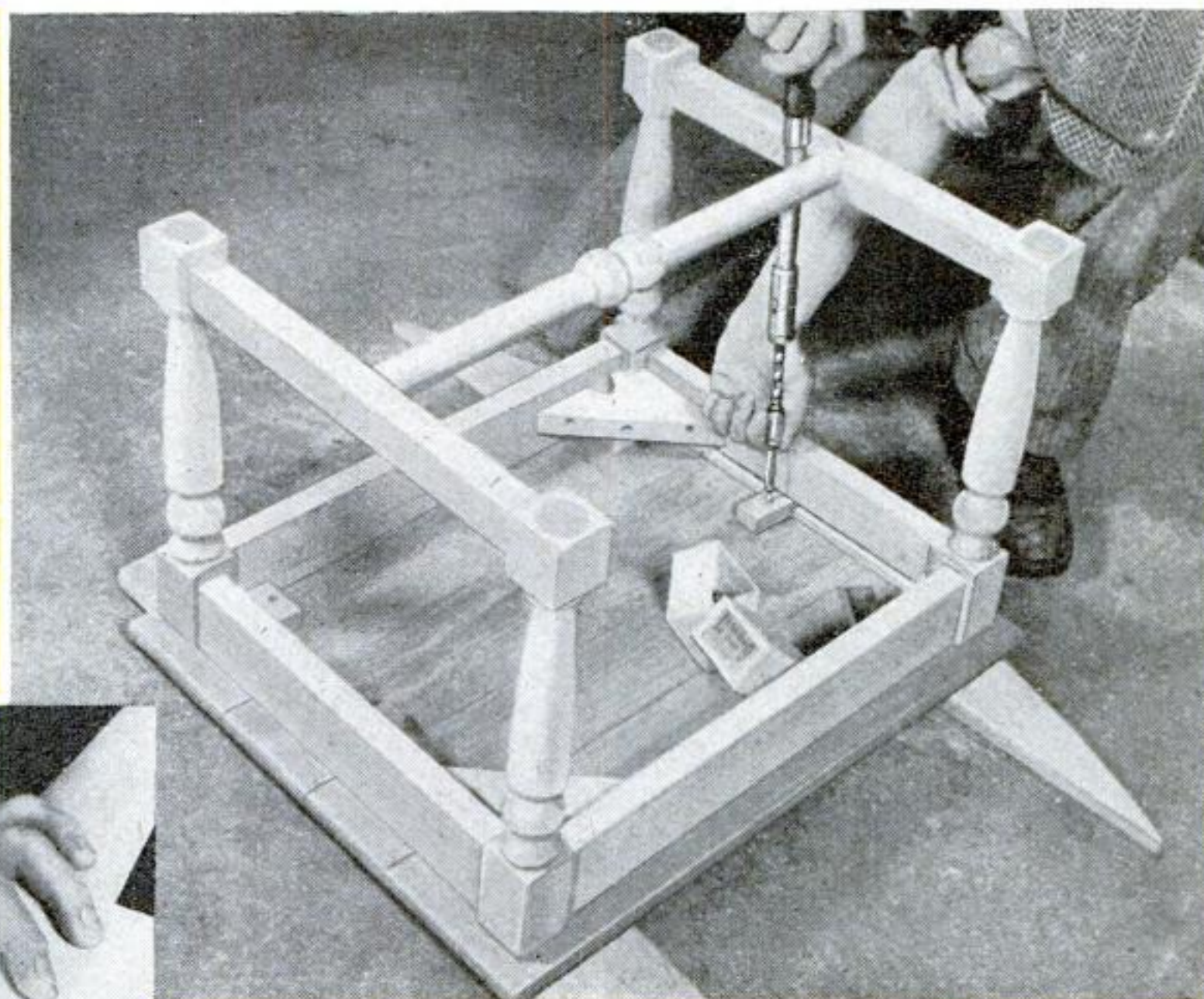
The side and end rails are cut "on the square" both ways, without leaving extra material for the joints, as the parts are to be doweled together. Note the doweeling gauge, which is composed of a card sandwiched between two pieces of scrap lumber. Always be careful to apply a gauge of this type from the face side or edge of the stock being marked.

It is best, at least for the amateur, to assemble both ends of the table first, and wait until the following day to complete the assembly, rather than to attempt all in one operation.

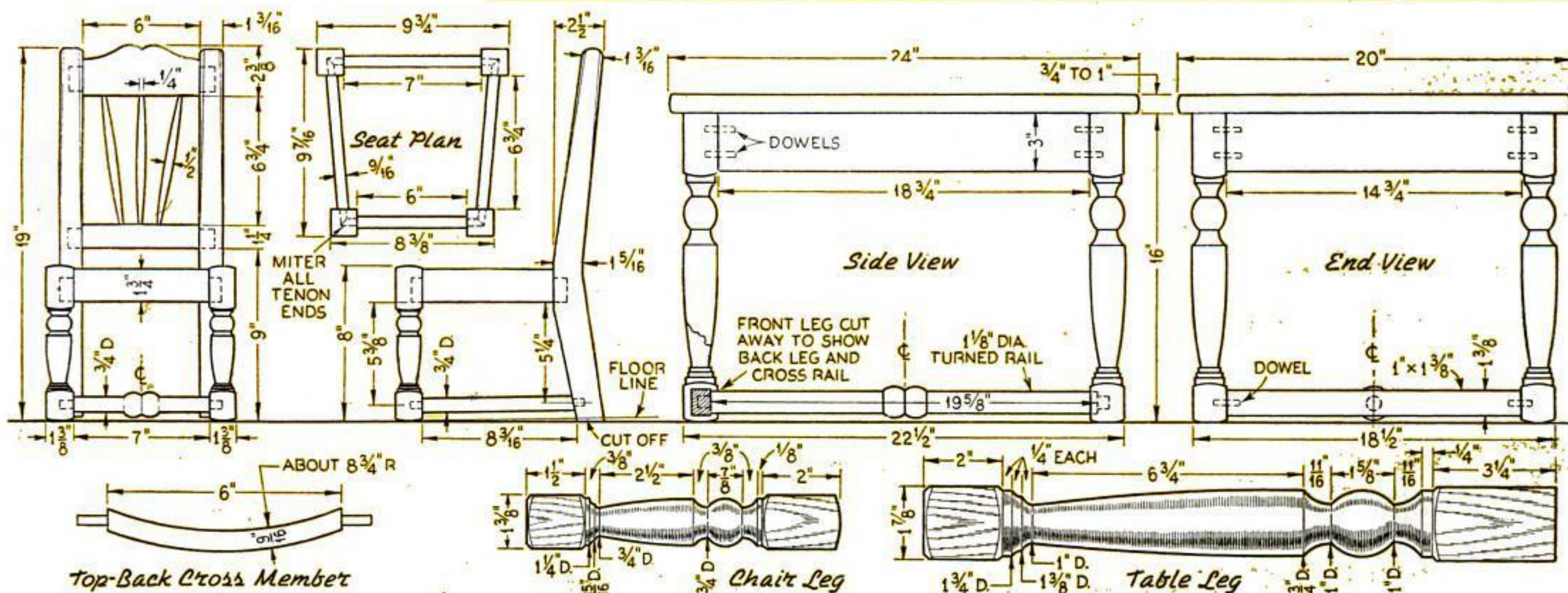
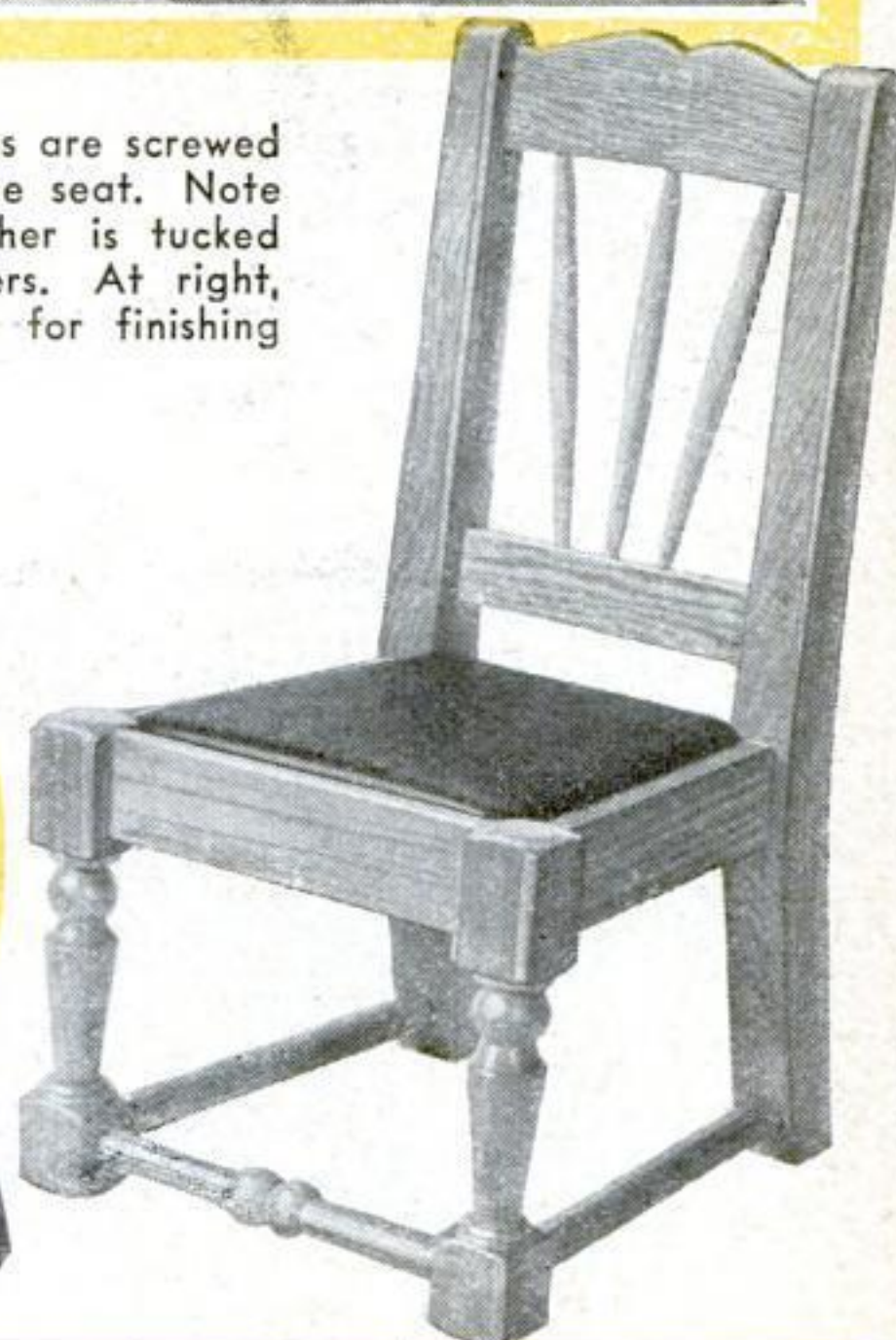
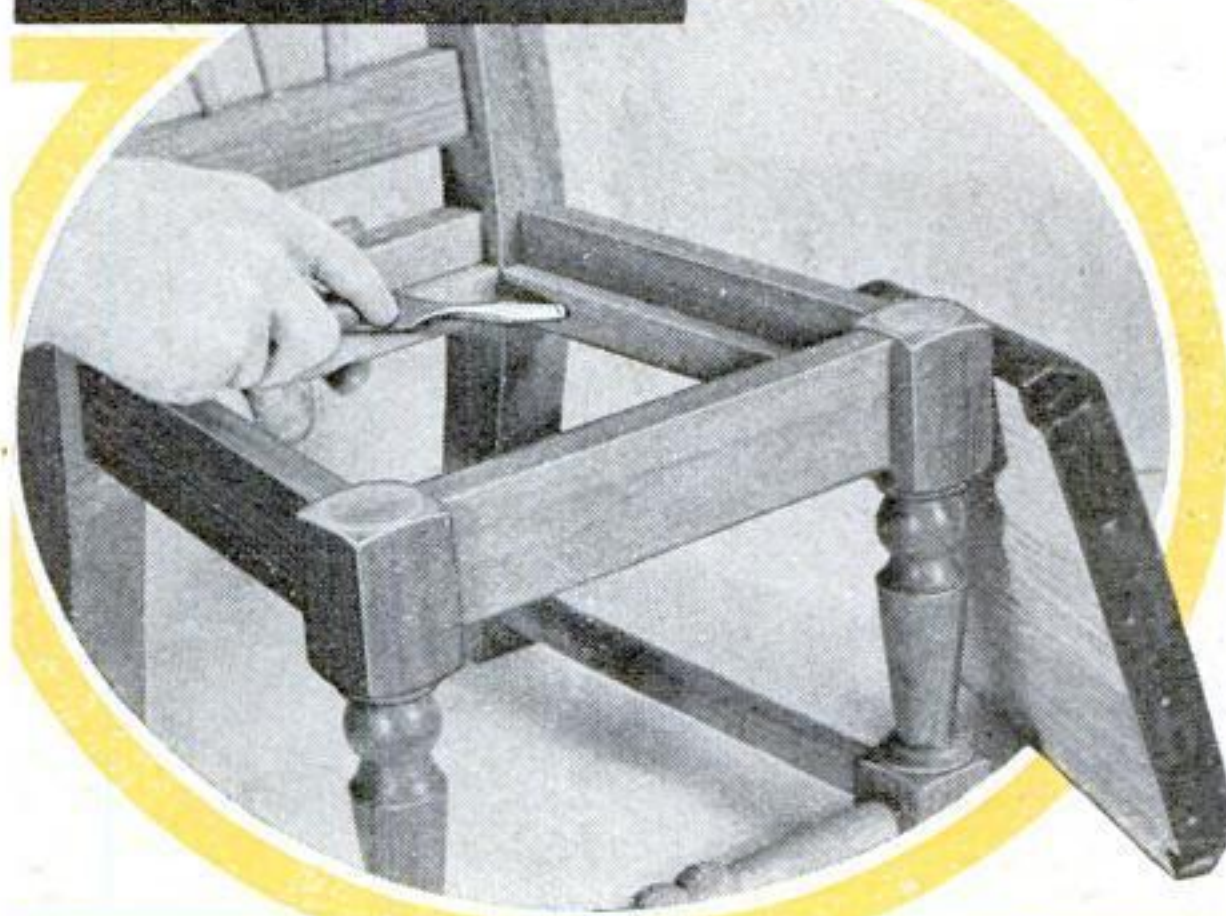
After assembly, cut and place the frame corner braces at alternate corners and fasten the top on with two "buttons" to a long side, and one at each end.

The top is fastened with wood "buttons" shaped so they will engage a groove in the rails. Each corner brace must be notched to let a button be placed close to the corner.

Below, a cardboard gauge for marking the dowel holes on all the table legs.



In oval, battens are screwed on to carry the seat. Note how seat leather is tucked into the corners. At right, a chair ready for finishing.



Working drawings. The thickness of some parts is optional; if you buy the rough lumber and dress it yourself, you can make them thicker.

Flashing Lights Illuminate Picturesque Fountain

ORIGINALLY designed as an inexpensive illuminated fountain for temporary use indoors at a church bazaar, the project illustrated below proved so successful that its designer, Ralph T. Merriam, of Altadena, Calif., removed it to the lawn of his home as a permanent feature.

The principal expense lies in having the shallow tank and the deeper central light well constructed from galvanized iron by a sheet-metal worker. Suitable diameters and a few other dimensions are suggested in the drawings, but the size can be modified to suit conditions.

Four small colored electric lamps are mounted in the central well, the bottom of which must be drilled to admit the light cable and the copper tube supplying the fountain. Install water and electric connections, then build a rough platform of the required height to support the water tank.

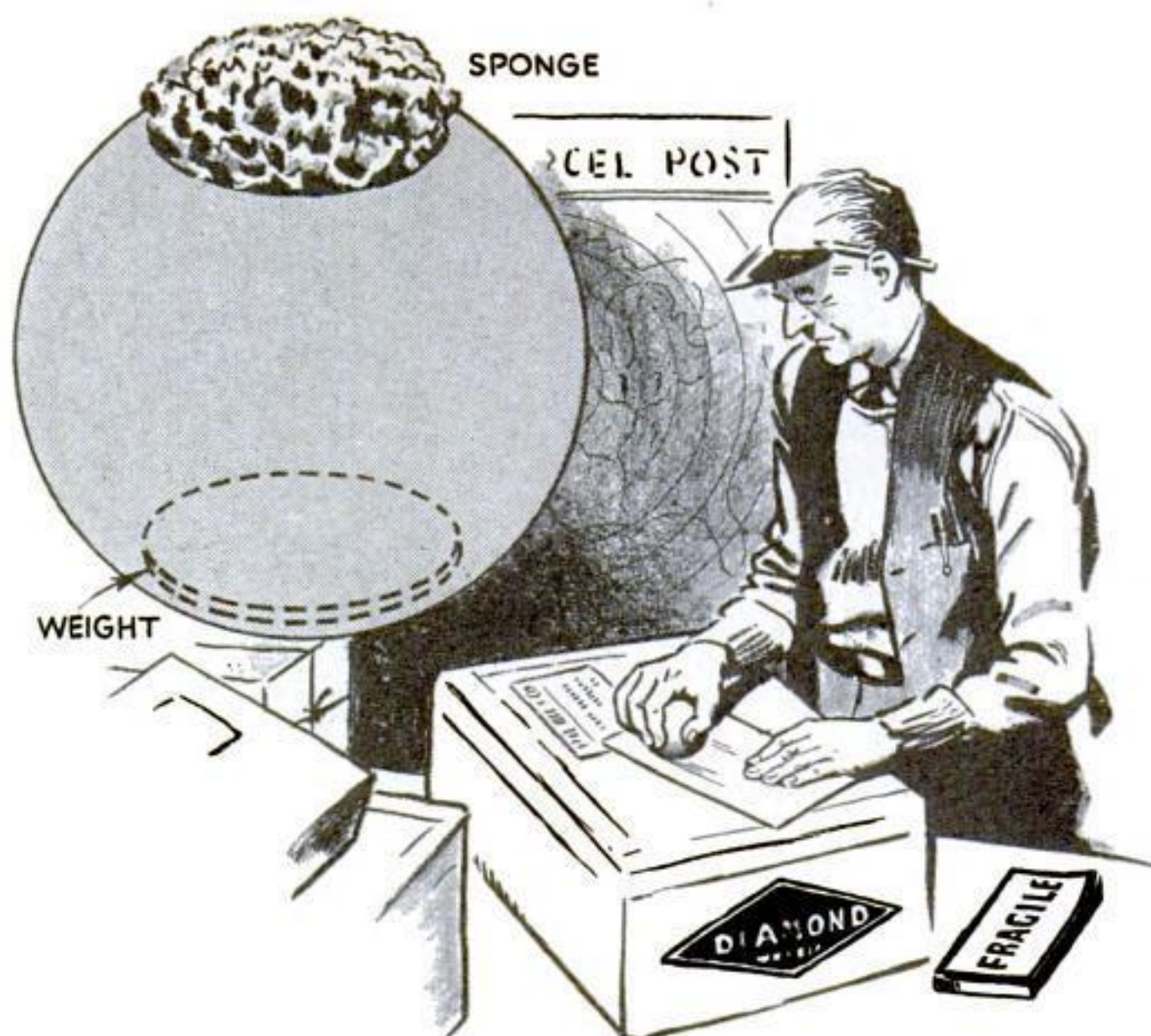
A disk of pebbled glass must be ob-

tained to cover the well opening, and in the center of this is mounted an ordinary shower-bath spray head of the type shown. A foot or two of the rubber tube should be left attached to simplify the connections. Copper tubing $\frac{3}{8}$ in. in diameter will supply all the water required. It should be brazed to a hose coupling.

A good location for the fountain is in a corner of the hall so that the drain and supply hose and the electric cable may be carried out behind it. If a central location is preferred, the hose and cable should be blocked on each side with boards having one edge beveled, and the whole covered with rugs. Put water hyacinths or other suitable plants in the tank and place small trees, potted plants, or shrubbery around the brickwork. When spring arrives, you may wish to move it outdoors into a corner of your garden.

Another appropriate place to put the fountain is in a corner of the sun porch, or perhaps even in the center if the room is large enough. By using ingenuity, you can undoubtedly devise many artistic arrangements.

If flashers are used with the colored lights, a very novel effect is produced as the various bulbs wink on and off. Of course, the lights can be left on all the time if preferred.—HI SIBLEY.



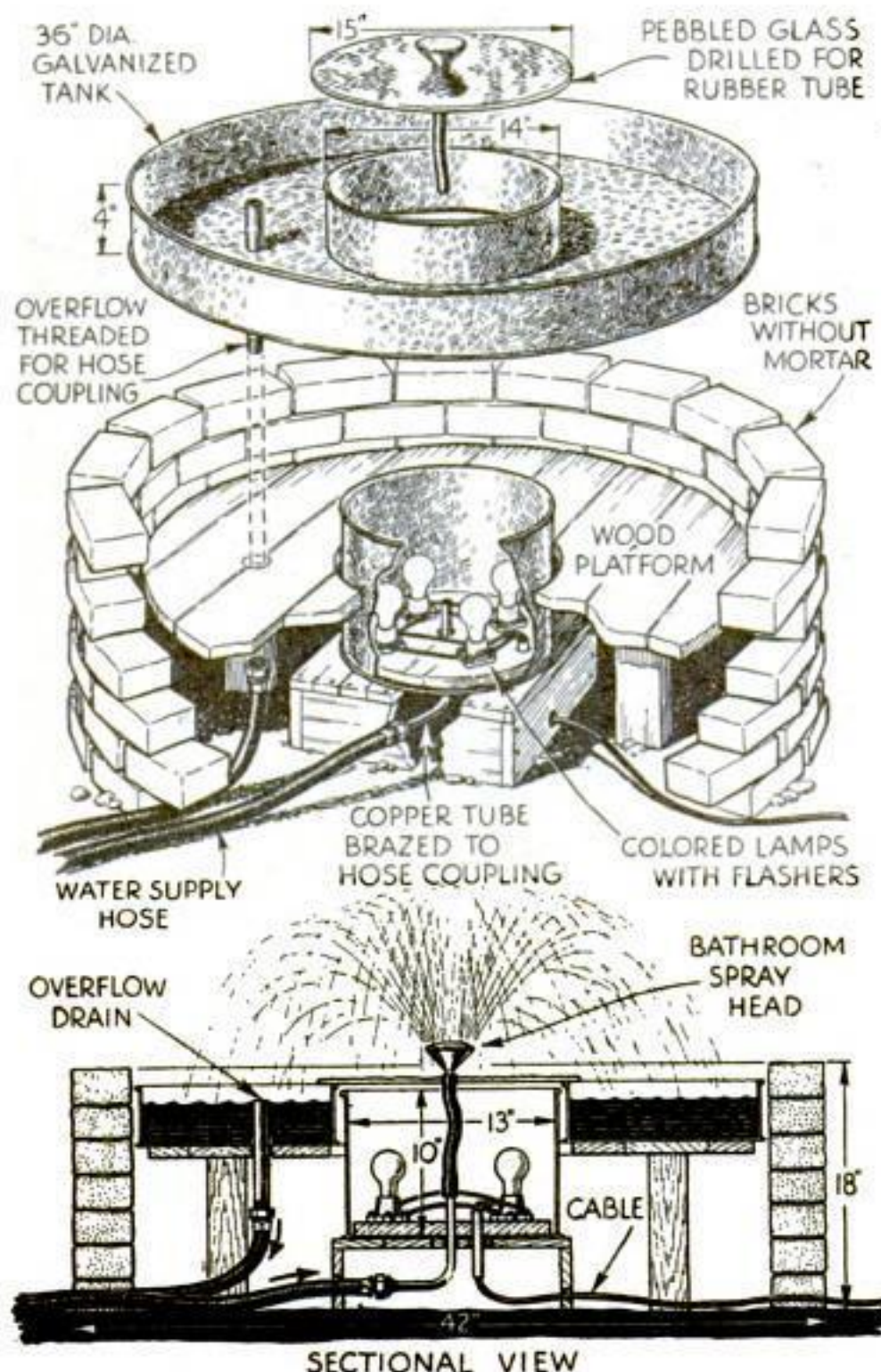
Hollow Rubber Ball Carries Sponge for Labeling Boxes

SHIPPING clerks and others who have occasion to paste labels on boxes and crates can make a handy moistener by cutting a small circular section from a hollow rubber ball, as shown. Drop a piece of lead or even a large iron washer inside the ball and pack the rest of the space with a sponge, which should protrude a trifle. The sponge is dampened by squeezing and releasing the ball in a pan of water or under a faucet. The purpose of the weight is to cause the ball to roll with the sponge up if placed on a flat surface.—G. E. HENDRICKSON.

Two Corks Are Better than One



MUCH-USED bottles, such as those holding chemicals required about the house and workshop, are easier to uncork if they have two corks instead of one. Coat the larger ends of each cork with cellulose cement or waterproof glue, then stick them together, as at the left. The upper cork will serve as a handle. When one cork becomes worn and compressed from long use, the position of the corks may be turned around.—G. S. G.



Method of making the fountain. Note that the bricks are piled up without mortar so there is no difficulty in taking the whole apart if necessary

When spring arrives, the fountain can be removed to the garden where it will be unusually effective for outdoor parties given in the evening



Keeping Shellac Cork from Sticking

CORKS are often used to close shellac bottles because it is so easy to set the brush handle through them and thus have the brush always ready for immediate use. However, the cork becomes badly stuck if the shellac is not used for some time. I prevent this by coating the edge of the cork with a little heavy lubricating oil.—B. K.



Vacuum-Cleaner Motor Runs BLOWPIPE

trolled with the hand blowpipe, which has a built-in valve. The easiest way to control the air is by regulating the speed of the motor, and this is done with a foot rheostat. If a rheostat is not available, use an air valve controlled by a foot pedal.

The air valve shown in the circle below was a discarded one originally used to operate twin air horns on an auto. In this case the air hose was cut in two and the ends connected with the valve. As the extra outlet was not needed, it was plugged.

The foot pedal is easier to operate if a spring is placed underneath. The spring shown with the pedal is a common spring clamp.—W. T. BAXTER.

WHERE electricity and city gas are available, a soldering and annealing torch for metal craftwork can be made from an old vacuum-cleaner motor and a hand blowpipe of the comparatively inexpensive type sold by dealers in decorative metal-working supplies.

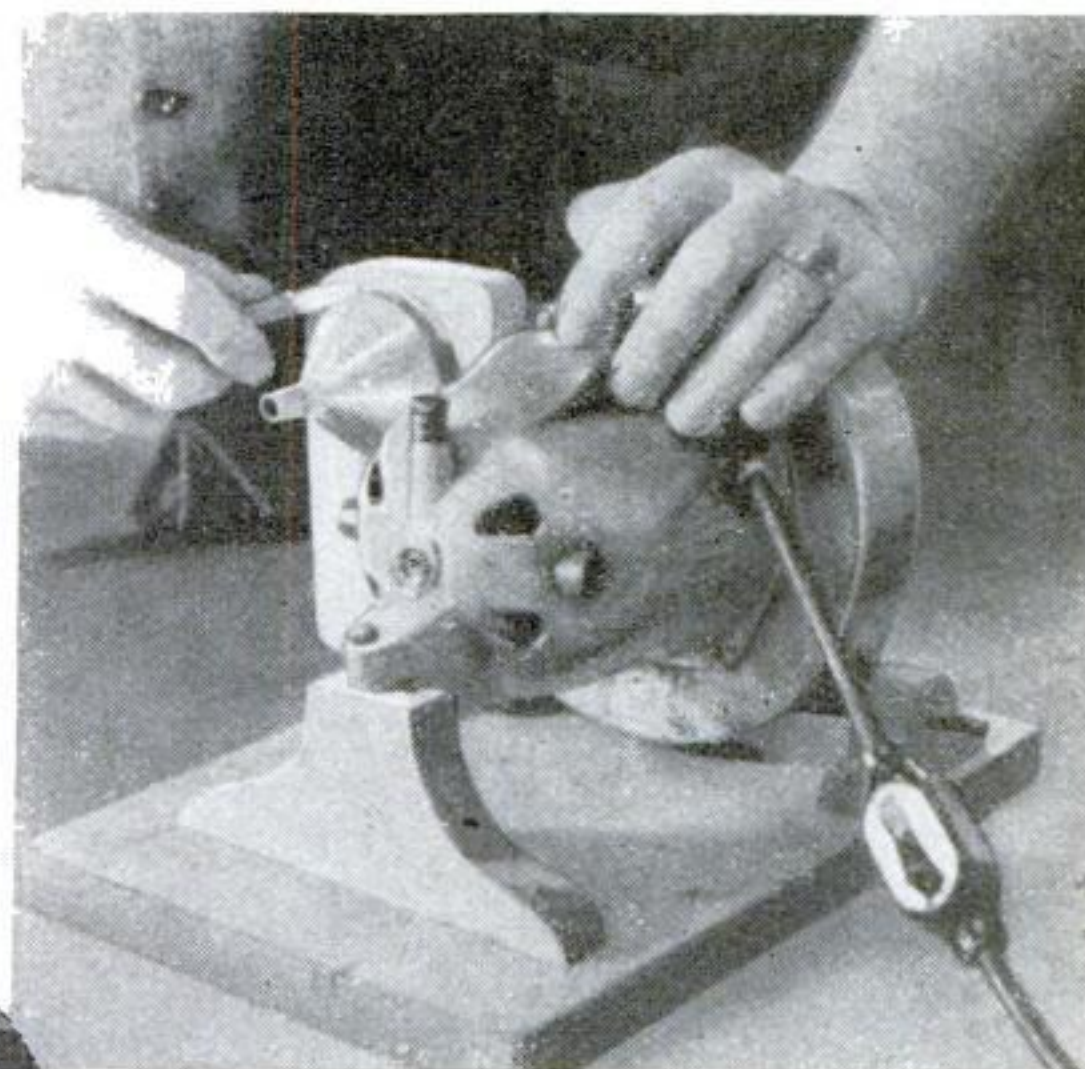
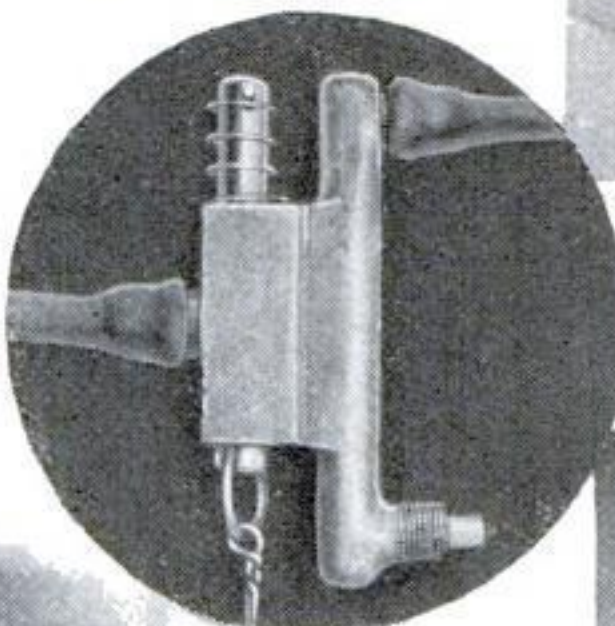
Remove the motor from its frame and mount it on the bench, on a shelf or bracket under the bench, or on a separate baseboard, as most convenient. A separate baseboard is best if the apparatus is to be moved about.

Take off the connection that goes to the dust bag, and in its place put a piece of wood, using a gasket compound between the wood and the metal to prevent air leaks. Attach a small funnel, as shown, over a hole bored through the board. Use tacks and cement around the edges. The gas may be con-

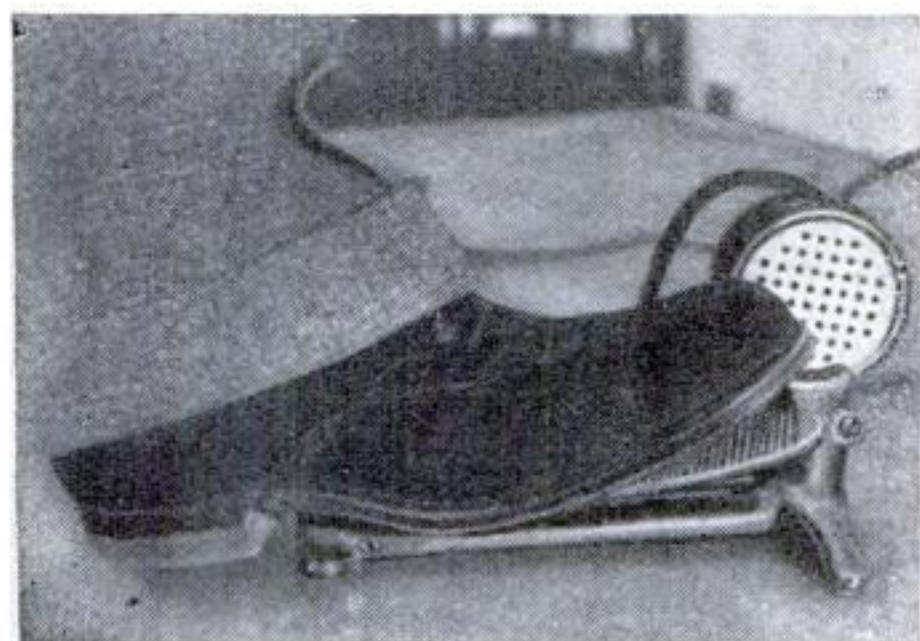


Using the blowpipe to anneal a copper bowl. Asbestos board protects the bench top from the heat

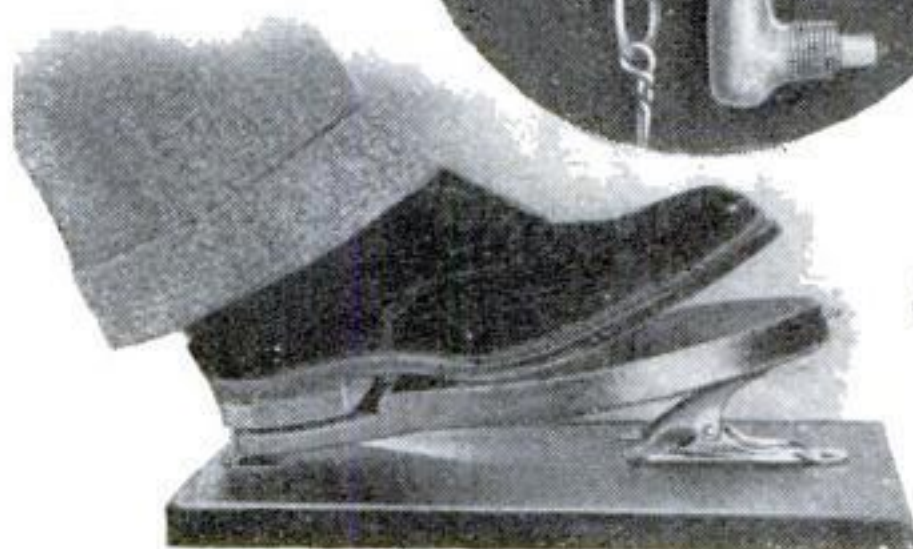
Right, a salvaged air valve serves when a rheostat cannot be obtained. It is operated by using a pedal



How to mount the vacuum-cleaner blower. The dust connection is replaced by a piece of wood to which a small funnel is attached



A foot rheostat controls the speed of the motor and thus regulates the volume of air



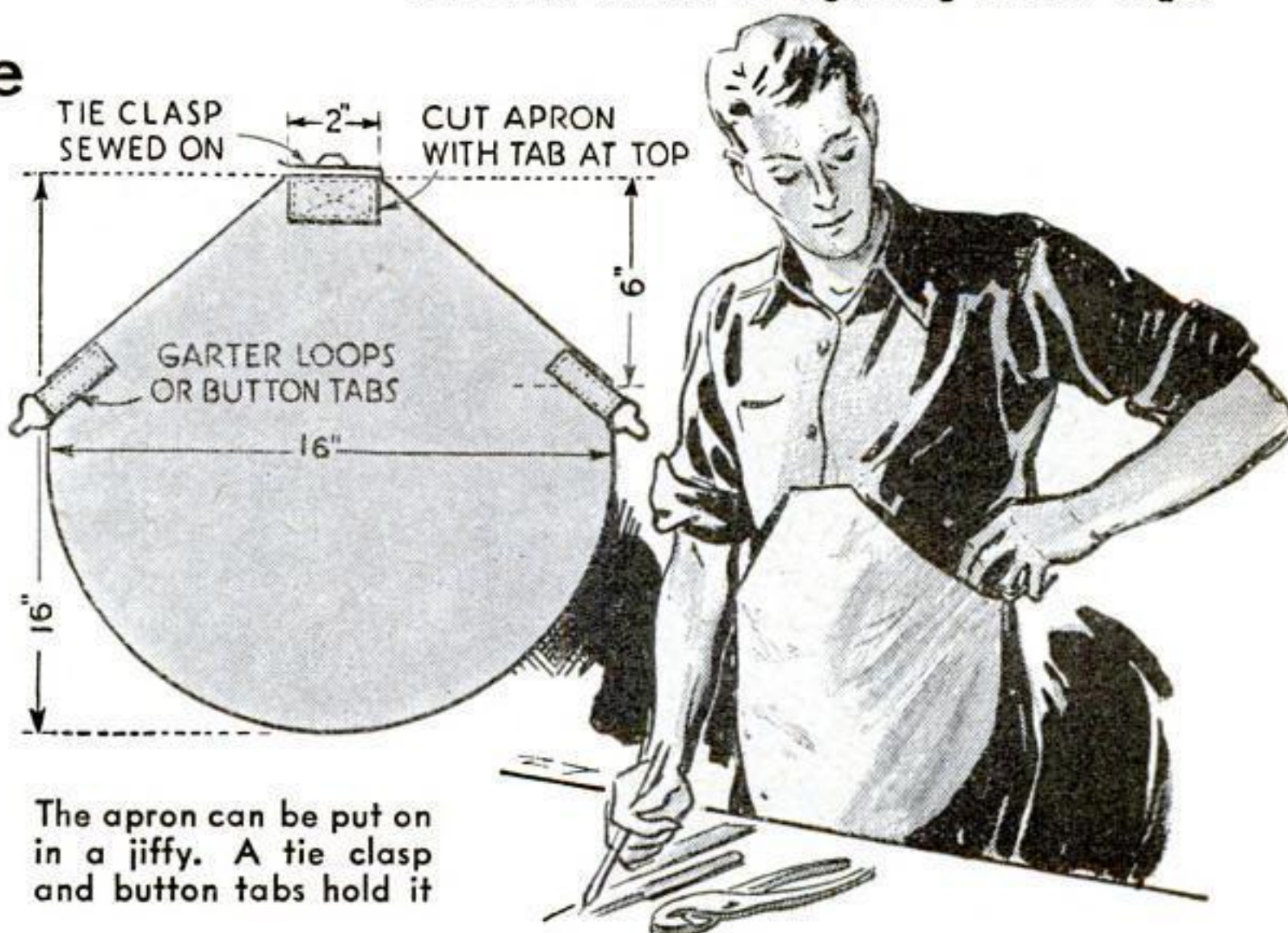
This is a type of hand blowpipe commonly used. It has a built-in valve for regulating the flow of gas

Homemade Apron for Shop Use Clips on Without Strings

STRONG cloth, an inexpensive chain-type tie holder, two garter loops or overall button tabs, and needle and thread are all the materials required to make a stringless work apron of the convenient type illustrated at the right. It is especially useful for shopwork because there are no tapes or strings to come loose or catch in machinery, and it can be slipped on and off in an instant.

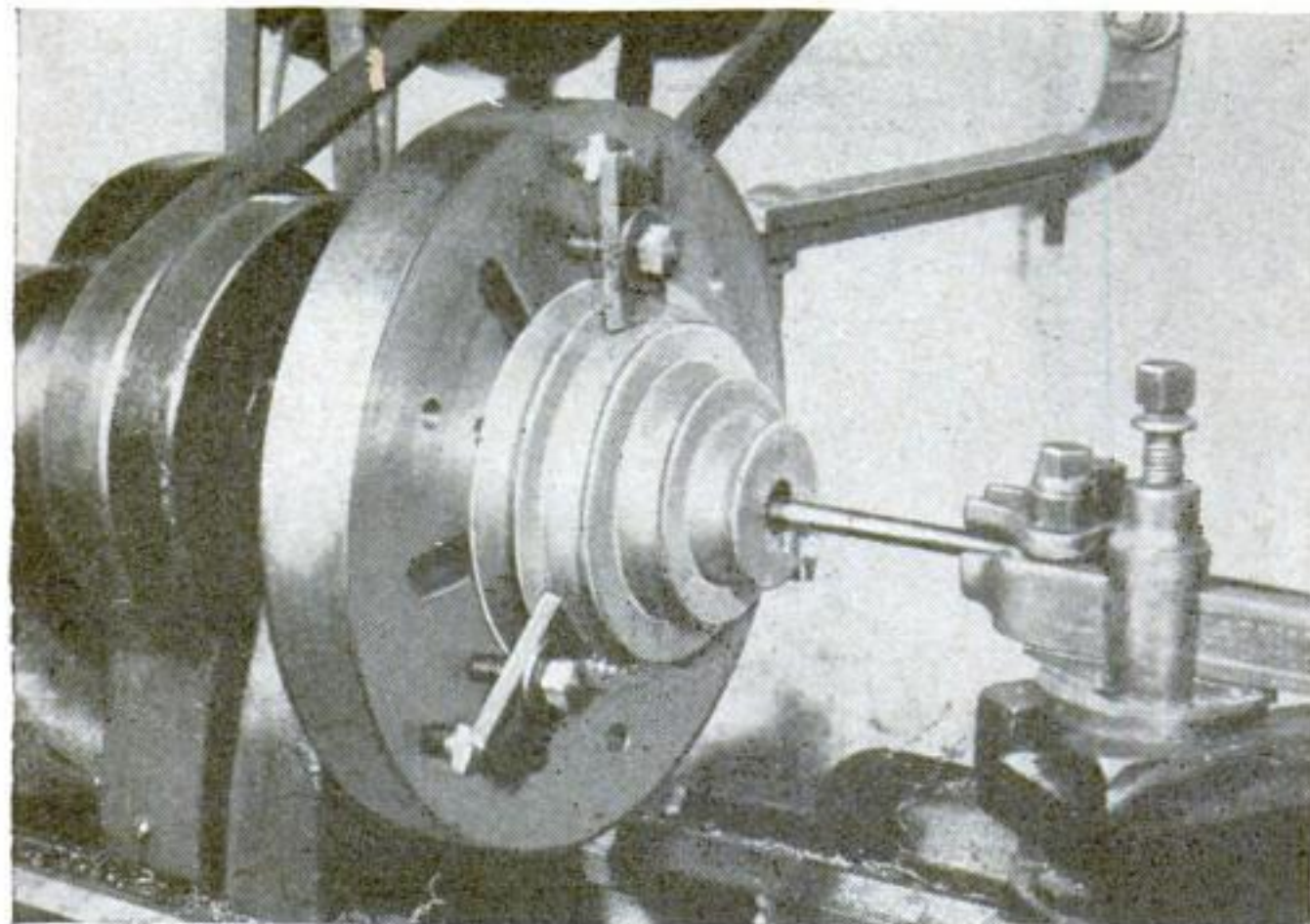
The cloth is cut out as shown, with a small tab at the top to be passed through one side of the tie holder, which is sewed in place. The small section of chain is removed from the tie holder as only the clip is needed. A short piece of narrow cloth tape is passed through each of the button tabs and sewed on as indicated.

The tie clip securely holds the top of the apron to vest or shirt front, while the two button tabs are looped over the suspender buttons of the trousers.—LAWRENCE N. OLSEN.



The apron can be put on in a jiffy. A tie clasp and button tabs hold it

Timesaving Way to Clamp Work to a Faceplate



The straps are quickly adjusted by turning cap screws, used in place of the ordinary loose and inconvenient blocking pieces

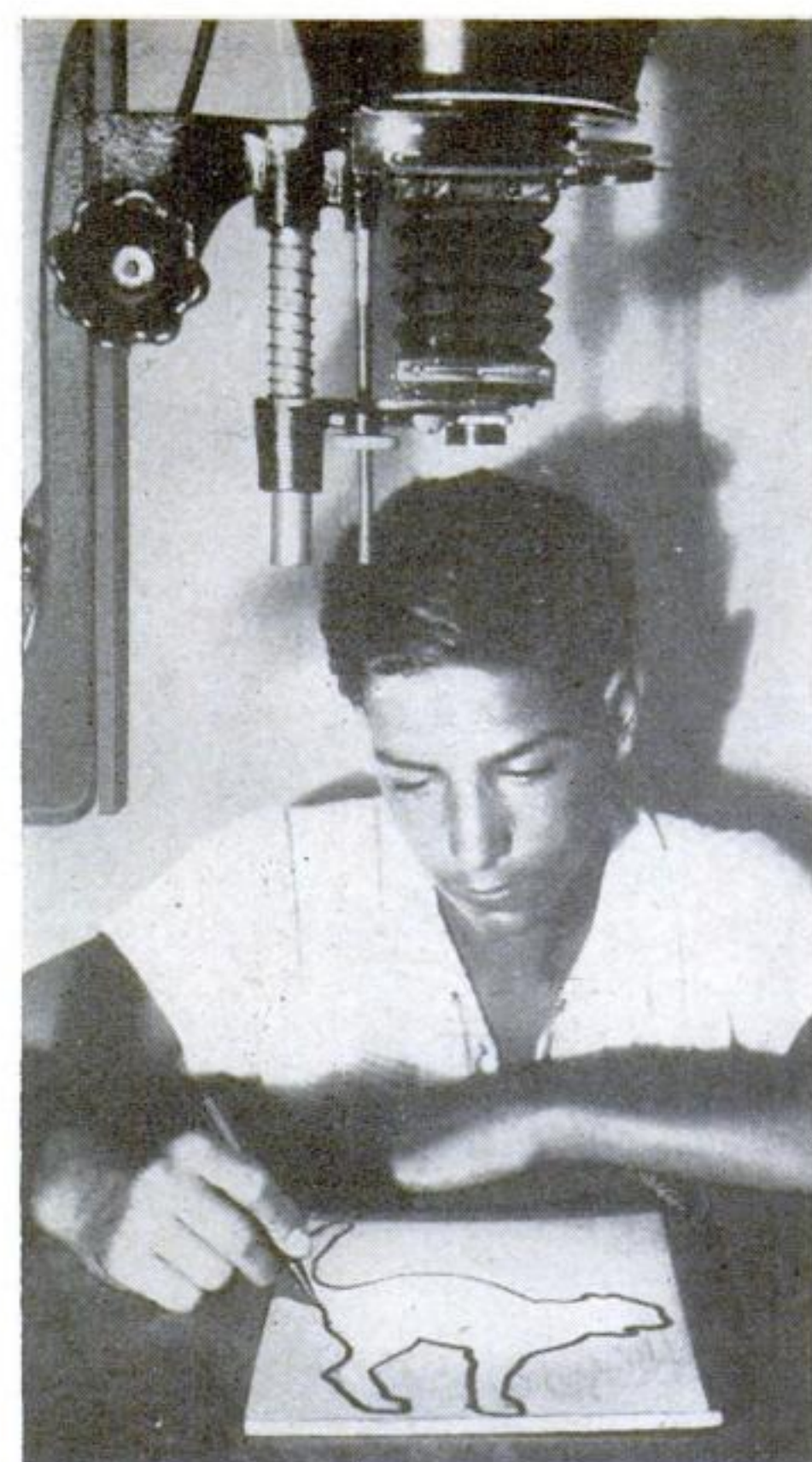
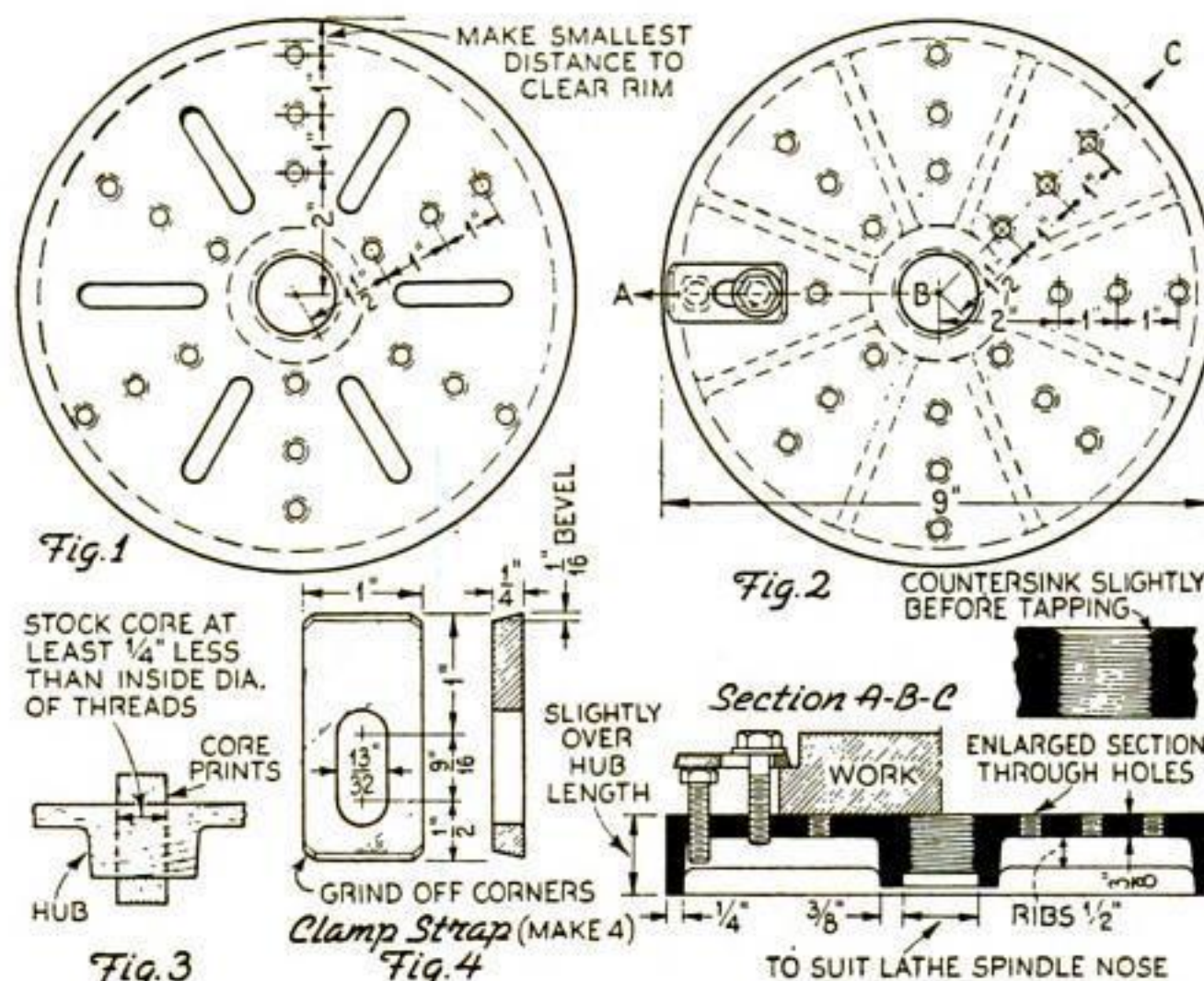
IN CLAMPING work to a lathe faceplate, the use of loose blocks to level up the straps may be eliminated by the method shown in the accompanying illustrations. The exact blocking height is obtained by screwing in or out a cap screw or bolt. As the hold-down bolt is also tapped into the faceplate, there are no unattached pieces to drop out of place when the bolts are loosened for adjusting the work. The photograph above shows a set-up used for boring out a pulley to take a larger shaft.

To adapt the standard slotted faceplate for using three clamps of this type, drill and tap holes for $\frac{3}{8}$ -in. cap screws as in Fig. 1. Note that the alternate sets of holes are spaced $\frac{1}{2}$ in. closer to the center. This staggered arrangement of the holes in combination with the slot in the strap enables work of any diameter within the range of the faceplate to be accommodated.

The faceplate shown in Fig. 2 was made especially for this method of clamping and provides for the use of four clamps on the work. Any machine shop can easily make up faceplates of this special design to suit the kind of

work ordinarily handled. The dimensions given are the maximum for the usual 9-in. swing lathe, and the design is sufficiently strong for any work likely to be done on this or any 11-in. lathe.

If, however, only light metal work is to be chucked, the pattern work may be simplified considerably by omitting the ribs and outer rim. Incidentally, making the outer ring extend farther than the hub allows the faceplate to rest firmly on the bench without rocking when work is being set up.—D. A. PRICE.



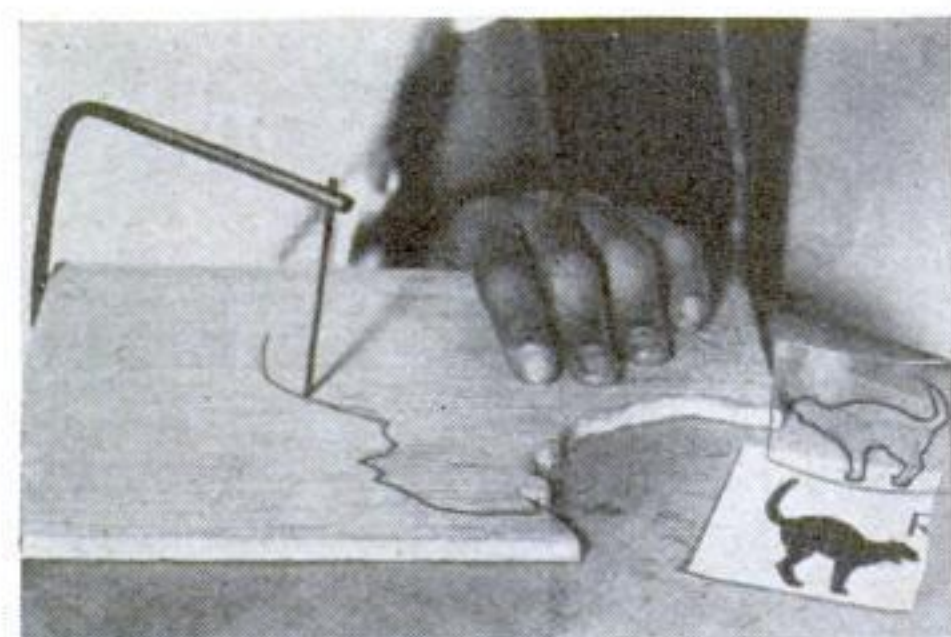
Jig-Saw Patterns Made with Photo Enlarger

JIG-SAWING is a fascinating craft, but many individuals have difficulty in making accurate patterns, since some skill in drawing is required. Magazine drawings are often made on squares to facilitate enlarging them to full size, yet even that method calls for considerable tedious work. If, however, a photographic enlarger or lantern-slide projector is available, perfect results may be obtained by tracing the small image on celluloid, then projecting it directly on the wood or other material, where the tracing is made full size.

If no sheet celluloid is on hand, remove the emulsion from some photographic film by immersing the latter in a lye solution ($1\frac{1}{2}$ oz. lye in 1 qt. water). Wash and dry the celluloid.

Select the desired drawing, and without removing it from the magazine page, place a piece of celluloid over the design and fasten it with tape. Trace the drawing with an ordinary steel pen and India ink. A bit of alcohol-moistened cotton will rectify any mistakes.

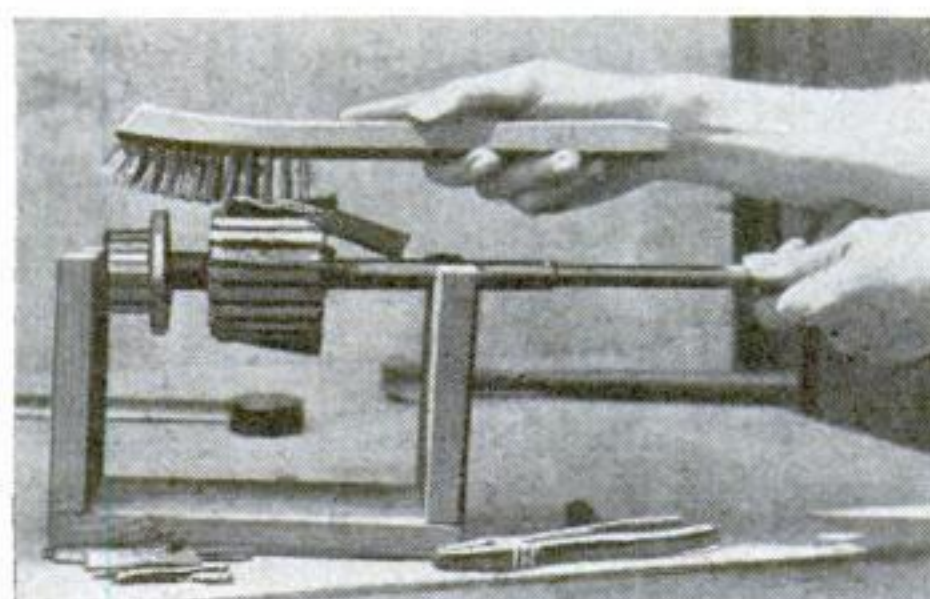
Place the celluloid tracing in the enlarger or projector and focus directly on the material. Trace the outline with a soft pencil.—NATHAN SPERBER.



Sawing the outline after it has been traced on celluloid and projected as in upper photo

Wire Brush Cleans Slots in Armature Core

STRIPPING an armature core of old insulating strips can be speeded up by placing the armature horizontally in a V-rack or vertically in the vise, commutator down, and brushing the pieces from the slots with a wire brush. The ends of the wire bristles engage the insulating-strip material and remove them easily. This is also an aid in cleaning the core of patches of rust and fragments of old paper or fiber.—W.C.W.



SIMPLIFIED SCALE MODEL OF A Stainless-Steel Amphibian

By
DONALD W. CLARK

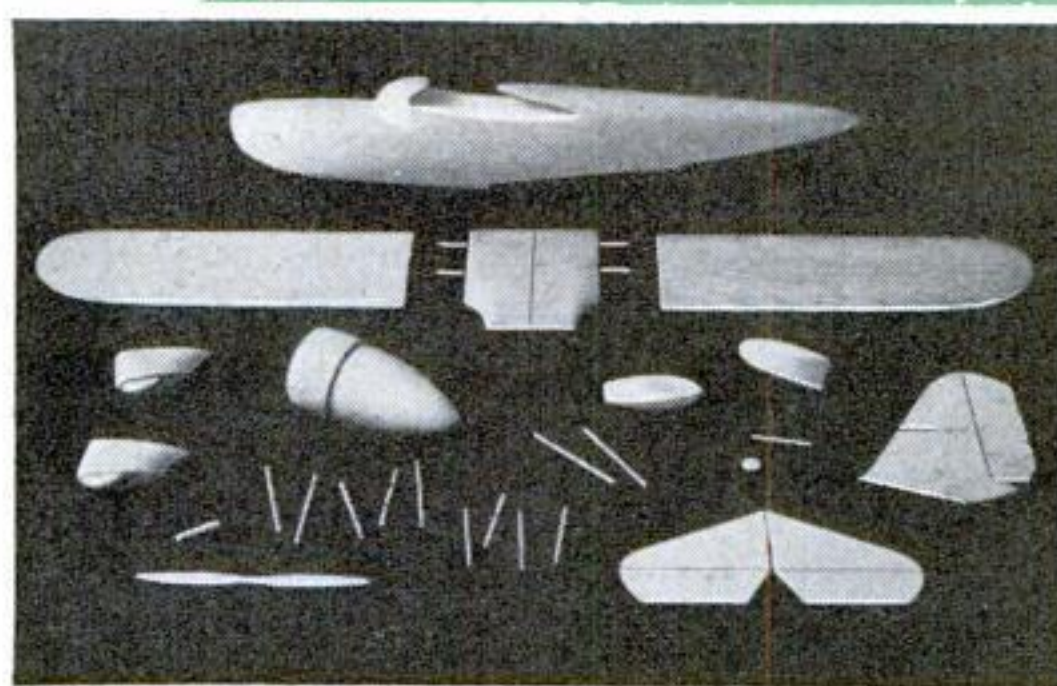
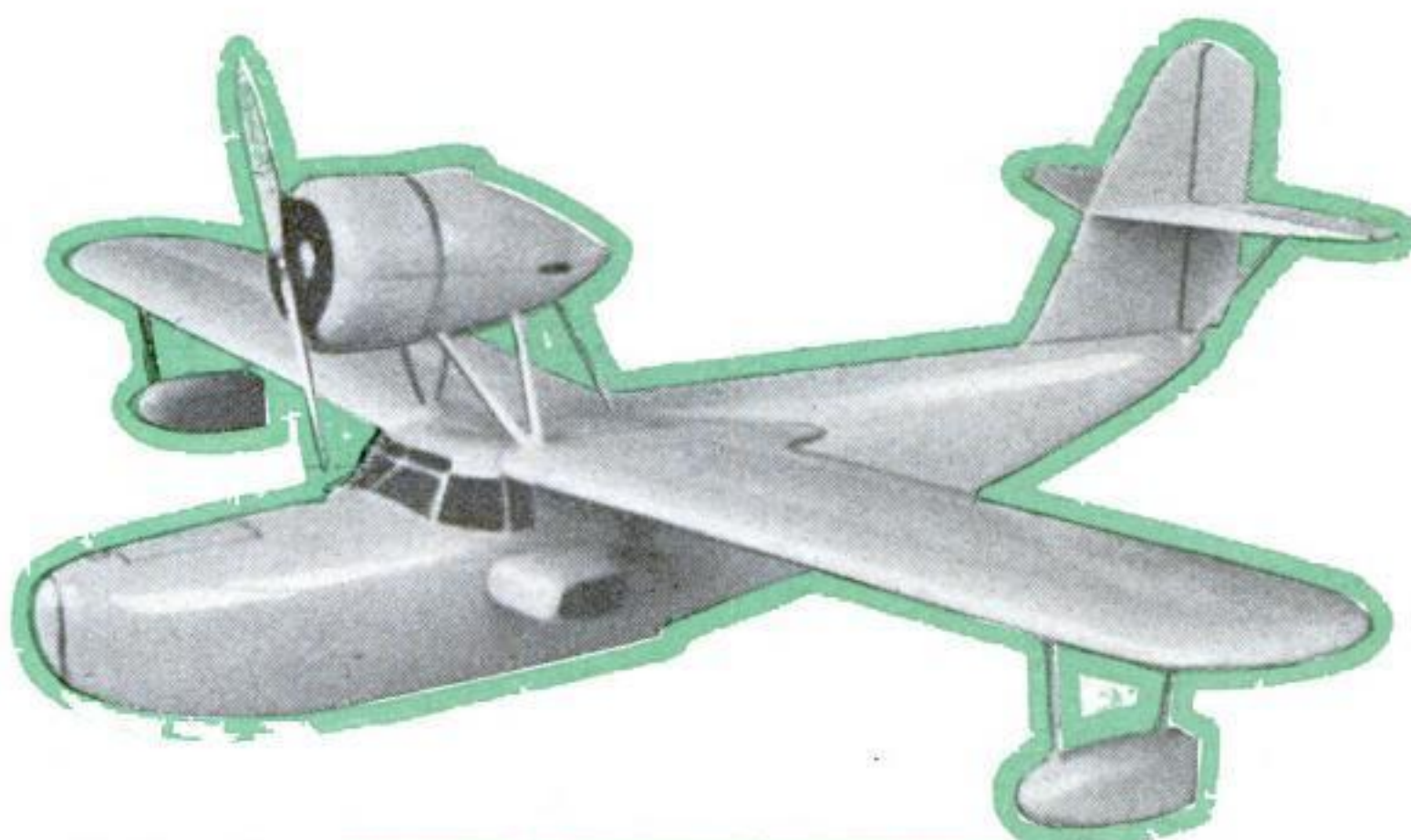
FIRST stainless-steel plane built for other than experimental purposes is the 285-h.p. four-passenger amphibian known as the Fleetwings Sea Bird. It is put together by a special welding process that makes the hull and wing practically a one-piece unit and does away with all protruding rivet heads.

The span is 40 ft. 6 in.; overall length, 31 ft. 5 in.; height, 12 ft. 6 in.; weight empty, 2,285 lb.; useful load, 1,130 lb.; maximum speed, 150 m.p.h.; cruising speed, 135 m.p.h.; landing speed, 47 m.p.h.; rate of climb, 900 ft. per minute; service ceiling, 15,000 ft.; cruising range, 450 miles. It is powered with a Jacobs seven-cylinder engine.

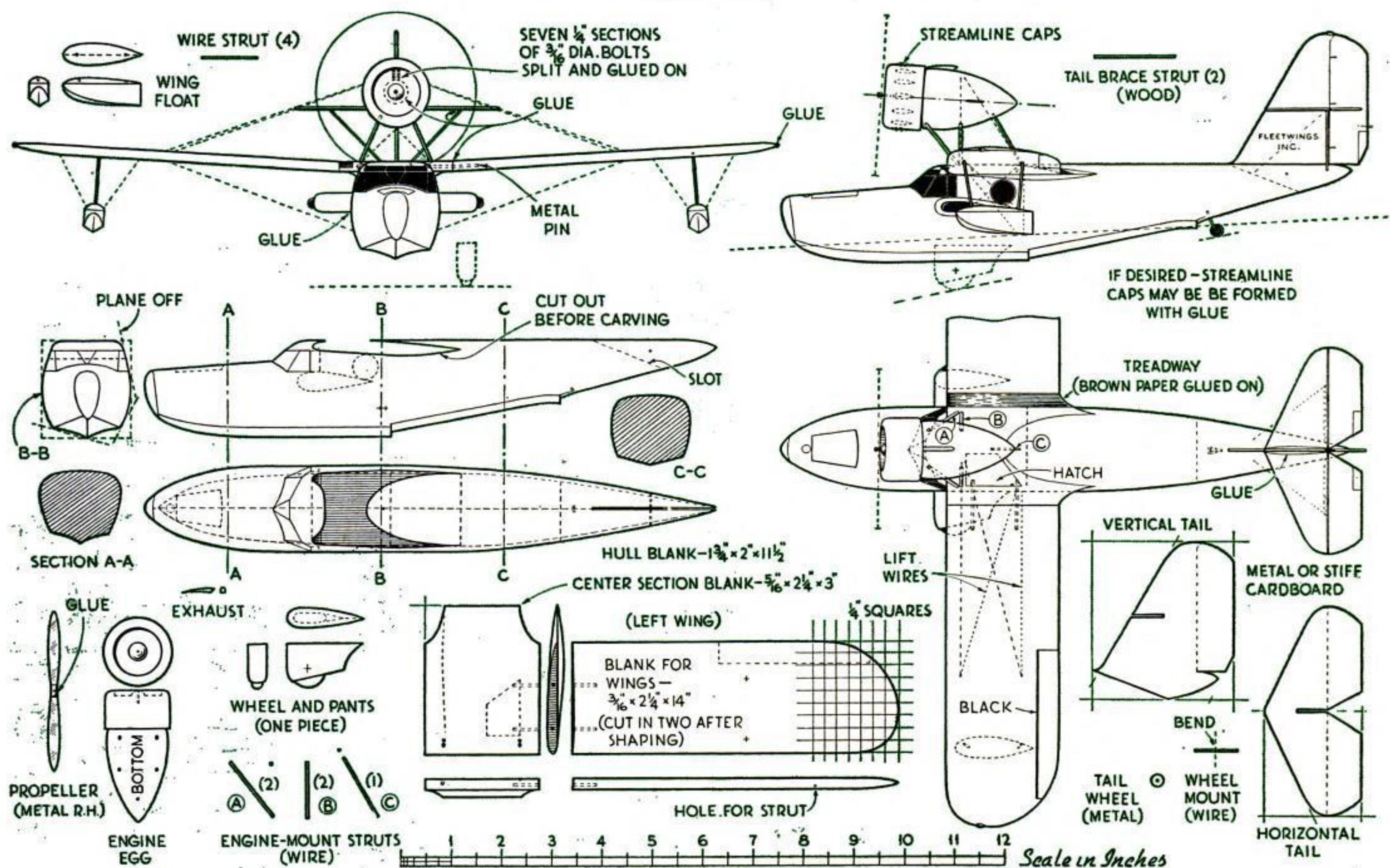
Any model builder should enjoy making a scale model of this neatly designed plane. The one shown is on our usual scale of $\frac{3}{8}$ in. equals 1 ft. There are twenty-six parts.

Wires brace the tail on the real ship, but struts are used on the model for simplicity. The recess in the hull for the center section can be cut in with a coping saw, and this should be done on the blank.

The entire plane is painted light gray or aluminum, and the cowl recess, tires, windows, and trim are black. The nose of the hull should be painted light brown to represent a cork-board bumper.



Painted light gray or aluminum with black trim, this model of the Fleetwings Sea Bird has a special appeal because of the unique construction of the original plane. The wing spread is $15\frac{1}{4}$ in., the overall length $11\frac{5}{8}$ in. The parts are shown at the left



Front, side, and top views of the Sea Bird, detail drawings of hull, wings, and other parts, and a scale in inches for finding dimensions

TEMPLATES to Improve

By HOWARD R. HEYDORF

WHEN several identical parts have to be turned from wood, the use of templates, provided they are properly applied, will give surprising accuracy and speed.

Templates are best constructed from wood that is about $\frac{1}{8}$ in. thick and at least 1 in. wide in the narrowest place after the pattern has been shaped. The design is carefully drawn on the face of the strip, which should be of a close-grained wood, well sanded to present a smooth surface for marking. The profile is then cut out on a scroll or a band saw.

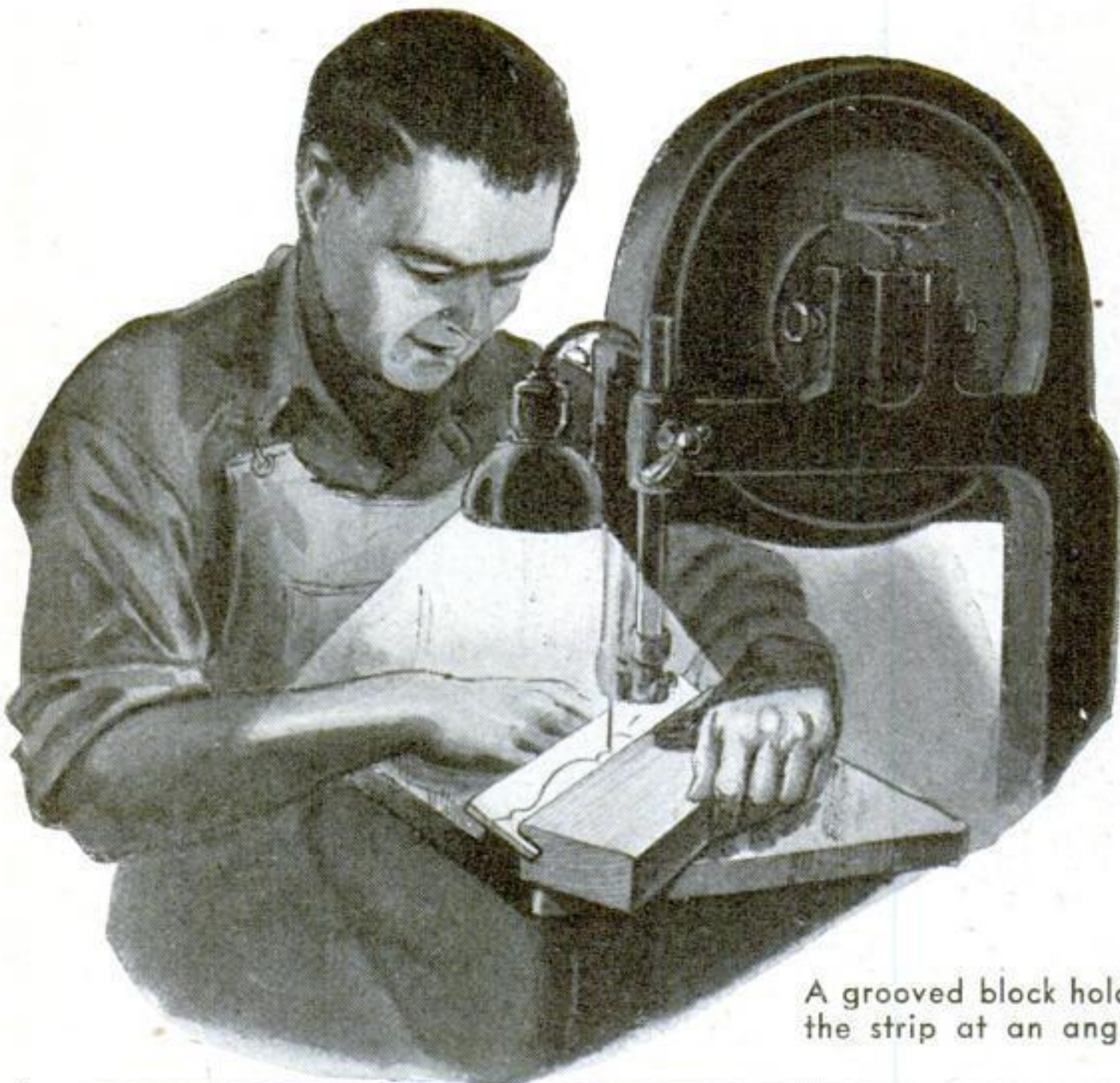
There is one refinement in making the template that well repays the little extra time required—sawing it at a slight angle so that the back of the working edge is undercut but the sides of the indentations are left square. This can be done by cutting a groove at the desired angle in the edge of a heavy scrap of wood and inserting the template strip in the groove so that it may be conveniently held for sawing, as shown at the left.

All templates, of course, must have some means of limiting the depth of the cut and regulating the proper diameter of the turning.

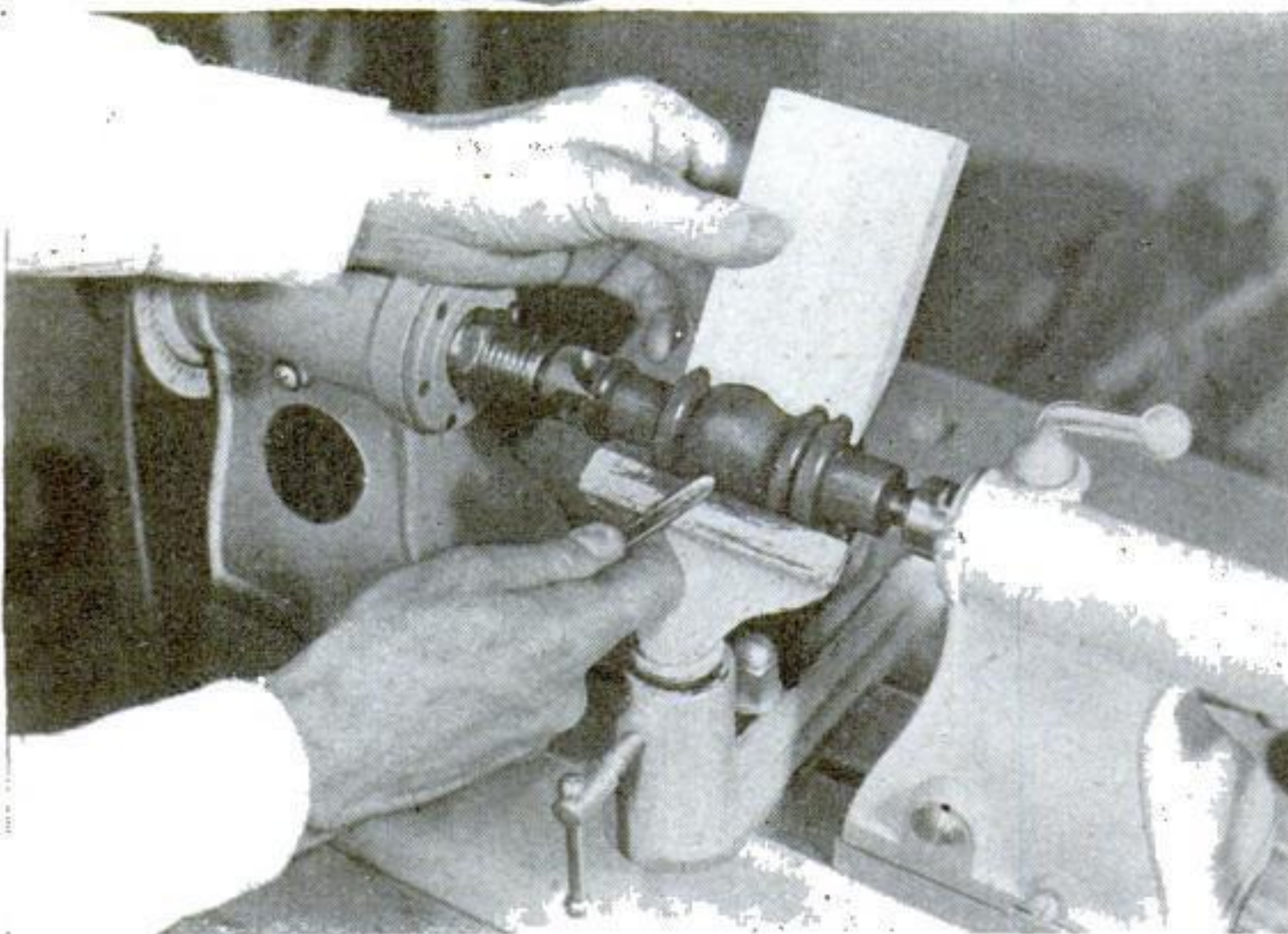
A grooved wooden strip is used to hold the templates when turning bowls and similar faceplate work. The size is regulated by turning the outside of the block to its largest diameter and the inside to its smallest diameter. The article is then turned and tested as shown, the wooden strip being held snugly against the rim during the testing.

For turning small spindles, the template may usually be held in place with one hand while the other grasps the

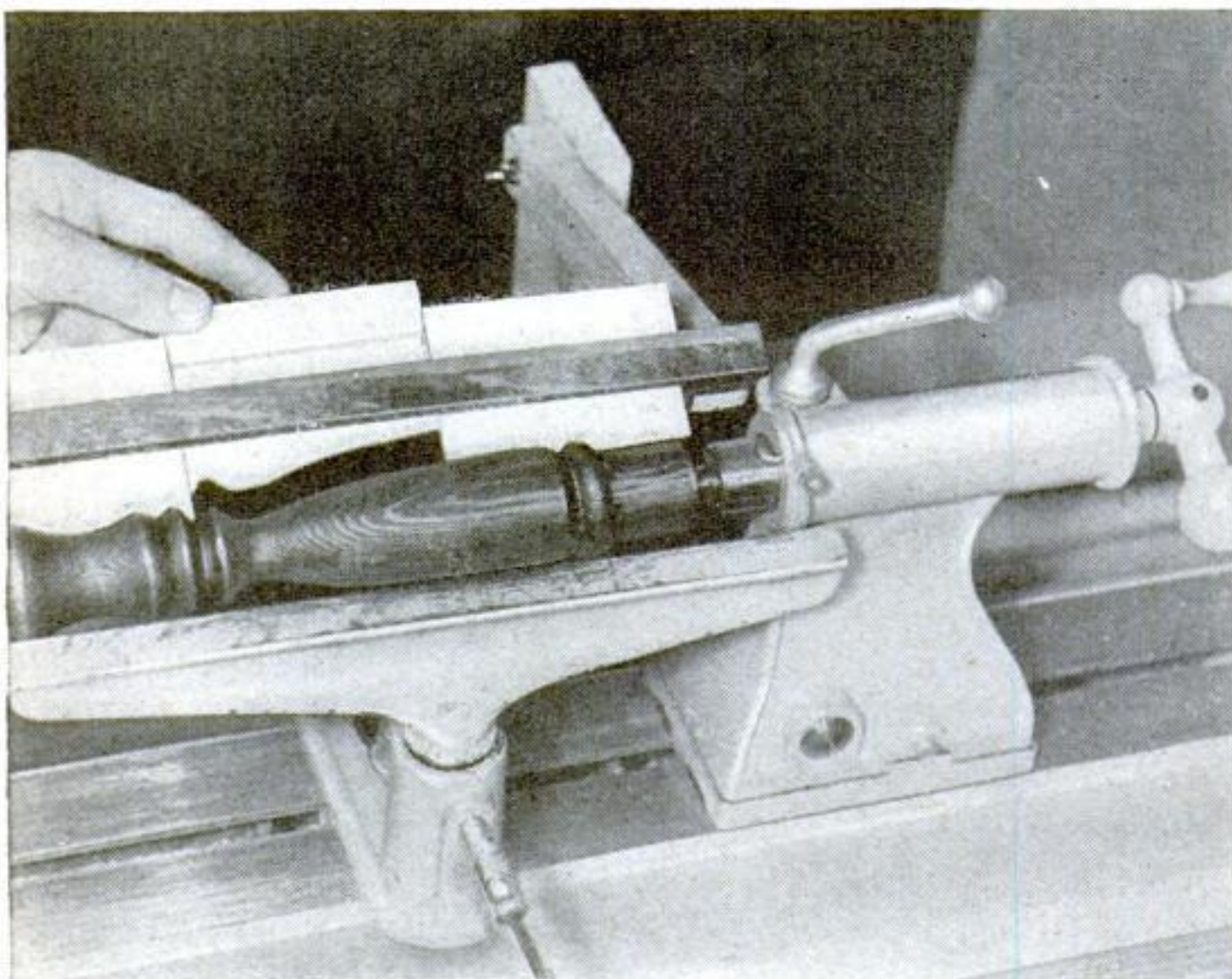
If the template is mounted parallel to the bench, it is well to add a small arm as shown below so it cannot be accidentally knocked down in case the template edge happens to be struck by the work



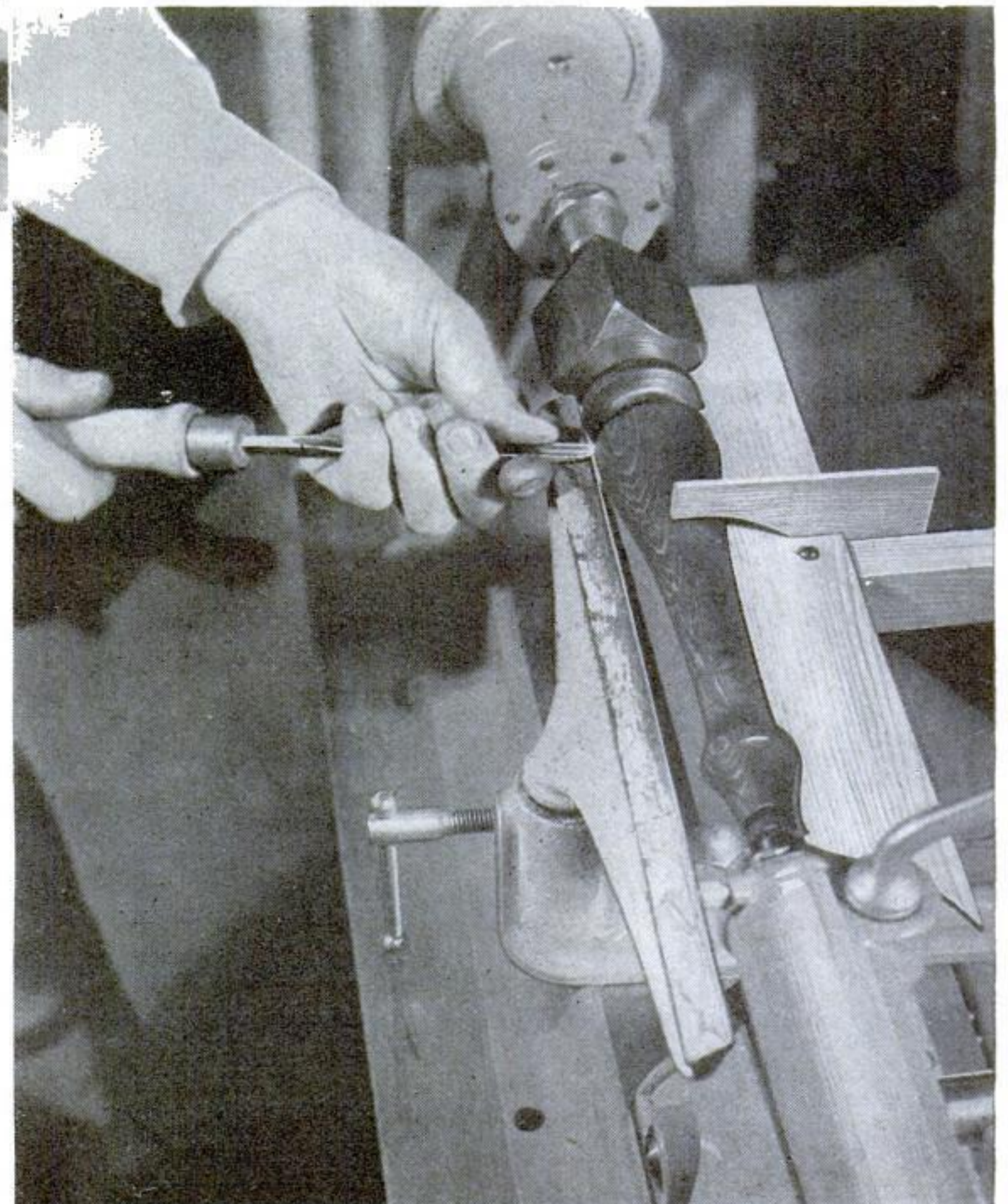
A grooved block holds the strip at an angle



With practice, the template can be held in one hand while the tool is manipulated with the other. The tenons are turned first and then used as stops to gauge the finished size of the spindle



For intricate work the templates are made in sections and inserted in a slotted wooden strip supported by arms. They should fit tightly enough not to shift unless purposely moved



Your WOOD TURNING

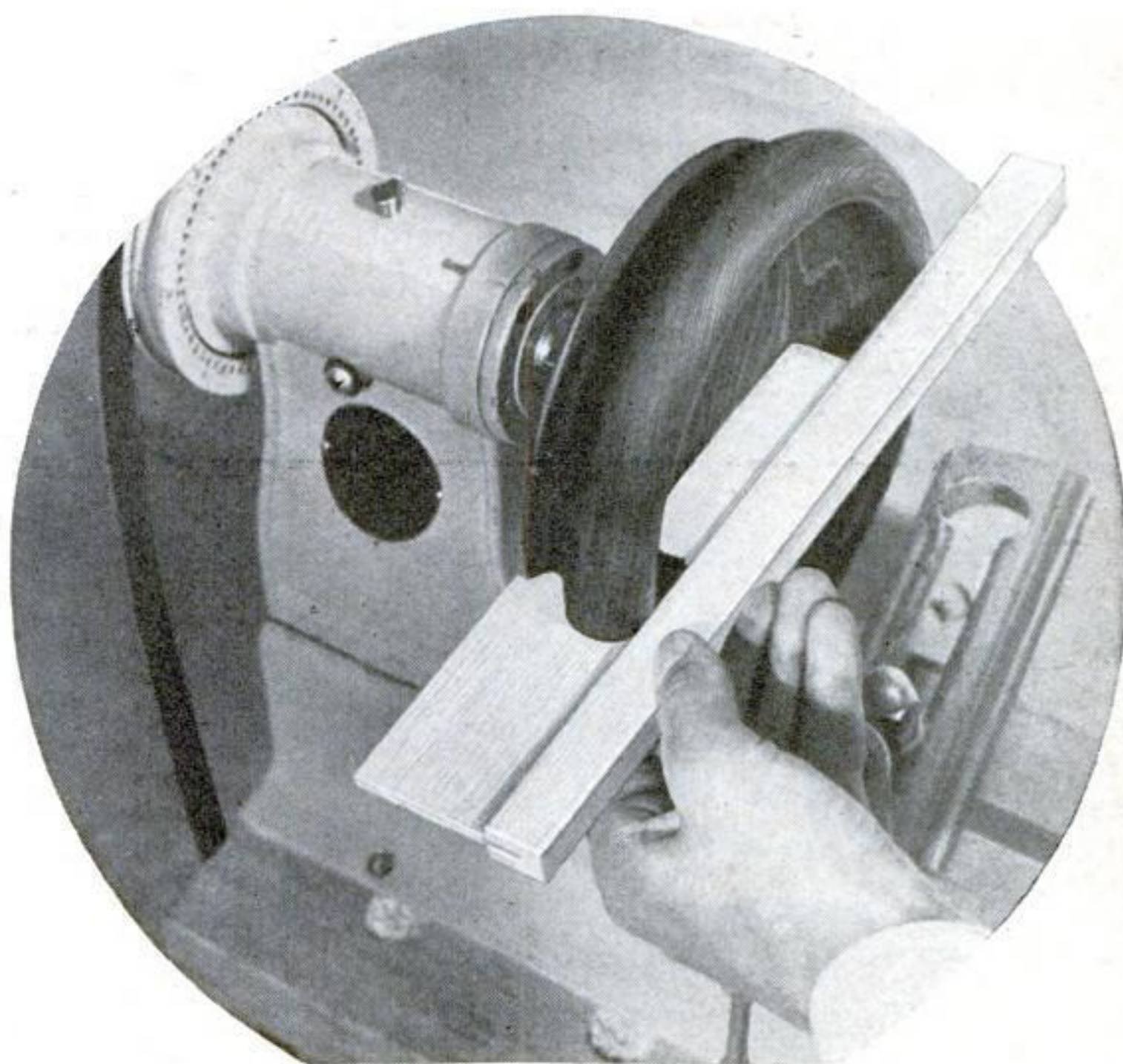
cutting tool as illustrated. The tool handle is clamped between the arm and the operator's body. With spindles of this type, the tenons are first turned to size and thus regulate the diameter of the rest of the turning.

For all ordinary spindle turnings, the templates may be of two slightly different types. They are held in position on the end of an adjustable arm, the details of this are clearly illustrated. As the work takes shape, the template is moved closer till it fits perfectly.

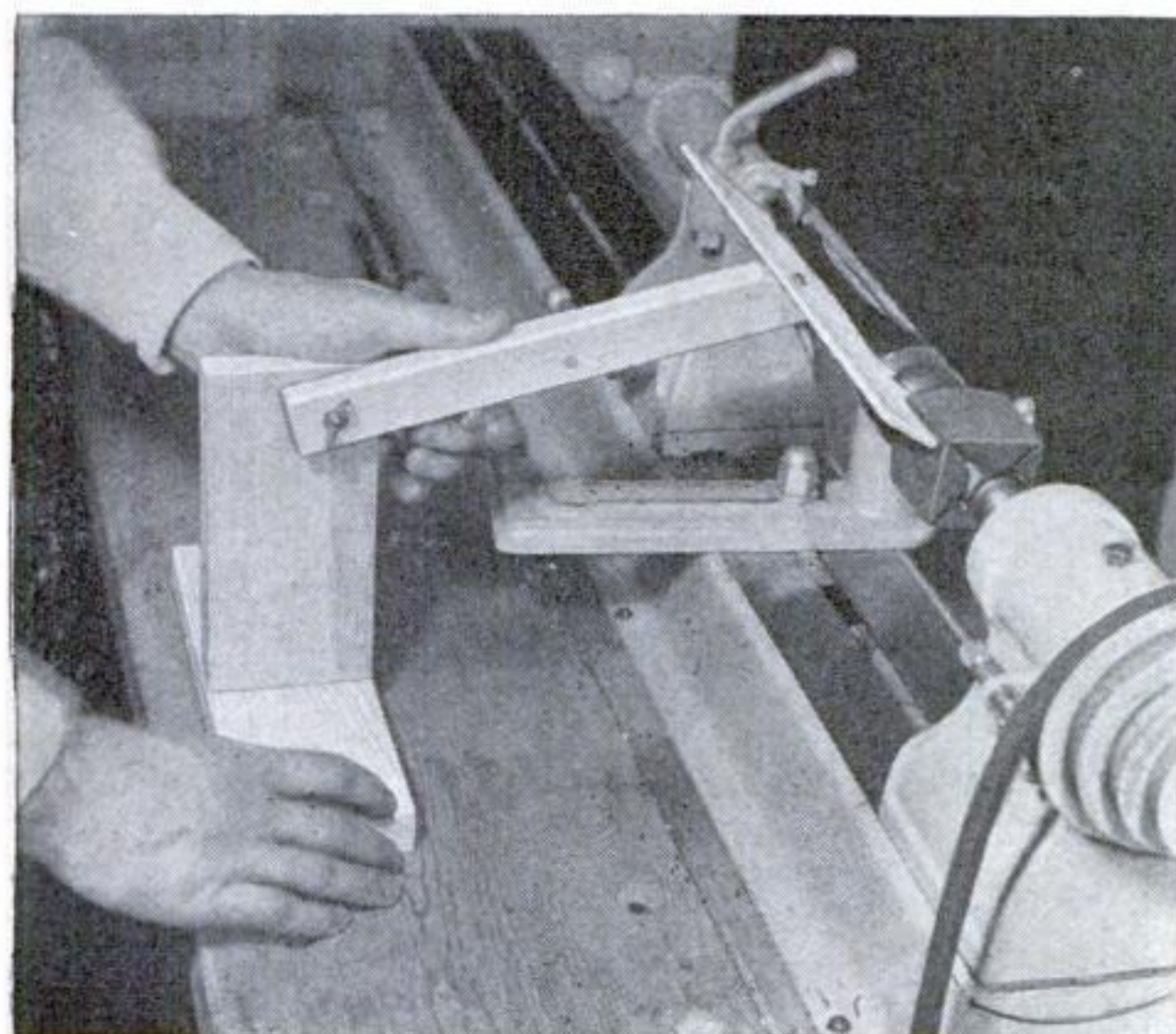
The template may approach the turning at two different angles. When it is at 45 deg. to the top of the lathe bench, it is more easily seen. If it is parallel to the bench, it is best to use a small arm to prevent the pattern from being knocked down in case it should accidentally drag on the shaping.

There is another type that is used only occasionally when a turning of intricate design is being shaped. A slotted wooden strip is supported between two of the wooden arms. Into this strip the sections of template slide. Small grooved strips on the tops of these limit the size of the spindle. In use, the spindle is turned for each pattern in turn, which makes it much easier than working down the whole spindle at once. Once adjusted, the arms are not moved during the turning operation.

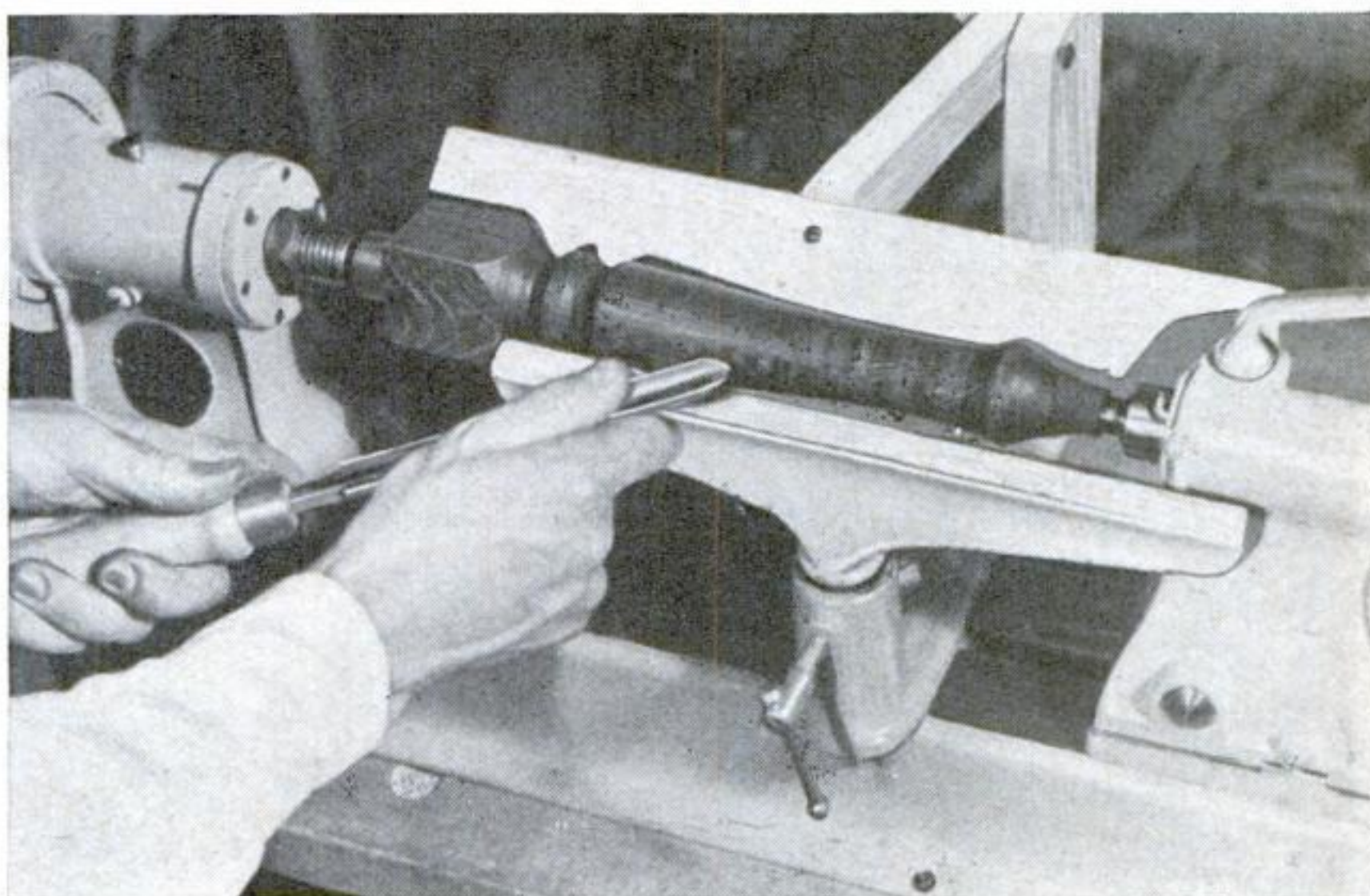
It is important that the lathe be operated at the correct spindle speed at all times when using templates, as nearly all the finishing should be completed with the cutting tools.



Testing a bowl with a combination outside and inside template held on one strip. The lathe need not be stopped while doing this

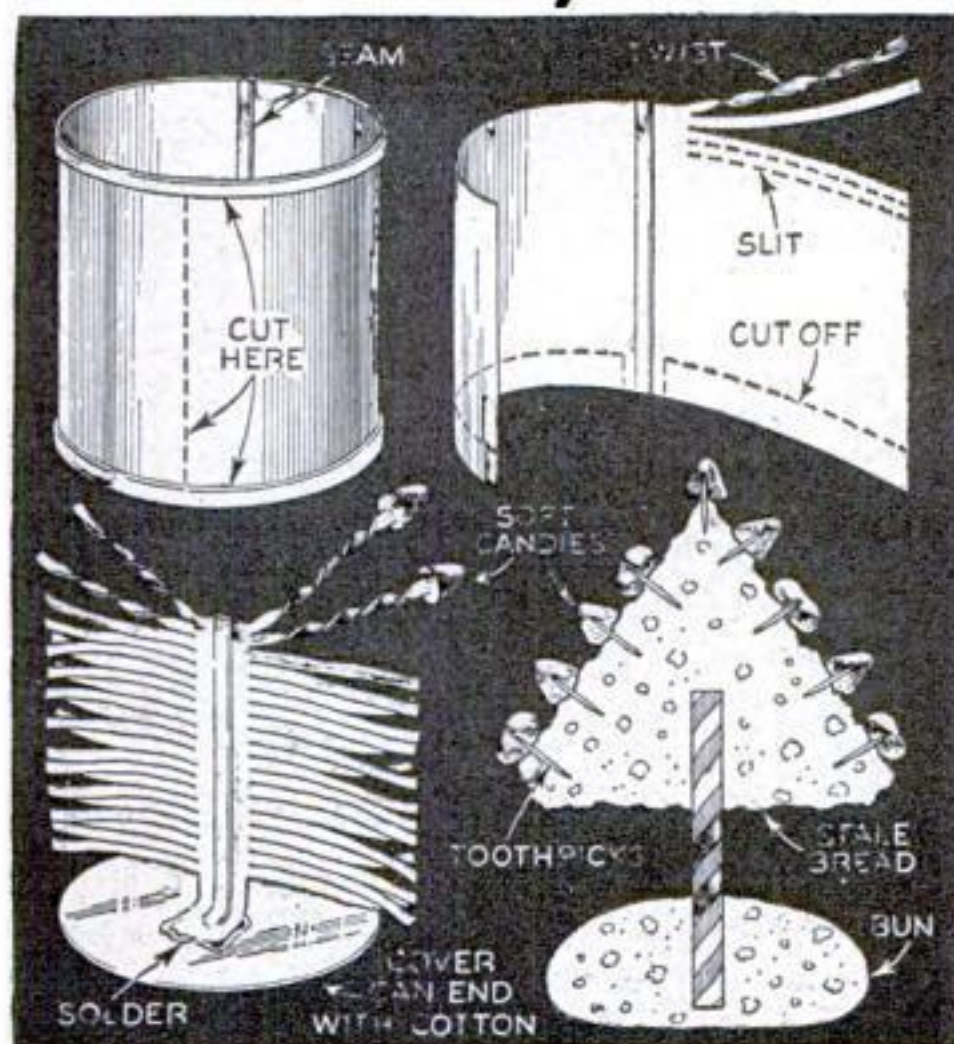


Template set at a 45-deg. angle by means of a 12-in. long adjustable arm. Clamp the base to the bench top



In this case the finished size is regulated by the unturned wood at one end and by a small projection that butts against the dead center at the other end

Candy-Bearing Trees Decorate Christmas Table



Two gay but inexpensive novelties



TWO colorful and amusing "trees" for the Christmas table are shown at the left. One is a little tin tree with gumdrop fruit. It is made by cutting a clean, shiny tin can as indicated and twisting the branches. The trunk is then soldered to one of the can ends. Cotton is placed around the base.

The bread-and-candy tree has a large bun or a cake for its base. A candy stick serves as the trunk, and a pyramid cut from a stale loaf forms the foliage. Candy "fruit" in various colors is secured to the bread with pieces of toothpick. Do not use pins for this purpose.—K. L. ROBBINS.

SERVICING Split-Phase HOME WORKSHOP MOTORS



EXTRA FIELD WINDING STARTS MOTOR

COMMON among the many types of motors found in the average workshop is the split-phase motor. It has two windings on the field section, one of which is used only during the starting period. An automatic centrifugal switch opens this winding circuit after the motor has attained full speed, and the operation is then that of a single-phase, straight induction motor. By means of the two windings, a sort of temporary two-phase action is produced, which is sufficient to start the motor.

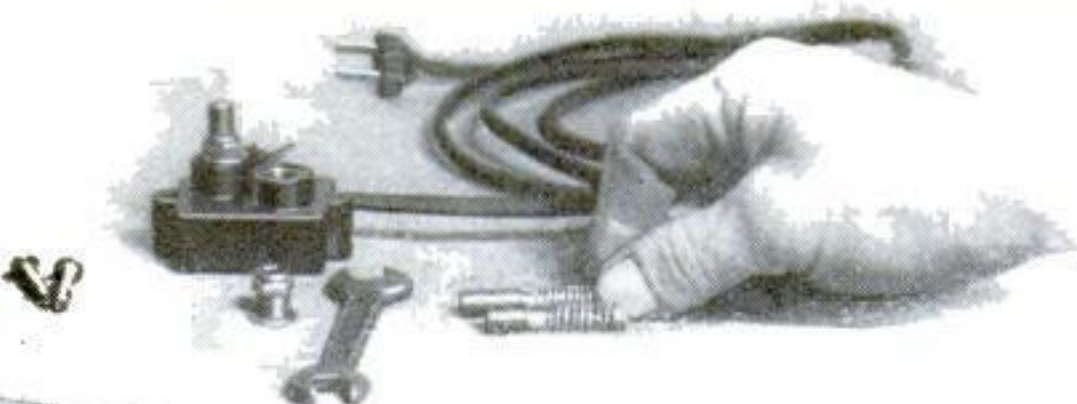
Such motors are useful for light power purposes. The illustration above shows two of them in a rather novel combination, but one that has proved very effective. The original motor, which forms the headstock of the lathe, has but one speed and is limited in its power application to wood turning and such work as requires one medium speed. A slide rest was made for this lathe to enable light metal turning to be done, and this calls for several speed changes. By fitting a four-step pulley on the extended motor shaft and using the second motor with a similar pulley to drive the former, just like an idle headstock in conventional lathes, four speeds are possible.

A POPULAR type of split-phase motor is shown in Fig. 1. This motor is somewhat peculiar because the field rotates and the armature is stationary. To carry the current to this rotating winding, two brushes are used; these bear on two brass rings that connect to the ends of the windings. The brushes and rings require attention from time to time to see that they make perfect contact. The insulating contact block is removed for inspection, and one brush is taken from its socket by loosening the threaded bushing in order to compare it with a new brush. It is apparent in this case that the old brush has worn considerably shorter than it should be for safety, so a new pair of brushes must be installed.

The next step is to loosen the four small nuts on one end and pry the sections apart (Fig. 2). Examine the brass contact rings and clean the surface with fine sandpaper (Fig. 2). This can usually be done, but if deep grooves have been cut in the rings, the only remedy is to place the rotor in the lathe and take a cut across them with a facing tool. Then rub them with sandpaper

By
Harold
P.
Strand

Fig. 1. One of the brushes is removed and compared with a new brush, if available. Badly worn brushes must be replaced with new



with a rag or brush, but do not lubricate them at all.

If it is desired at any time to reverse the rotation of the motor, it is necessary only to interchange the two leads that connect to the screws at the brass rings (Fig. 3).

It is well to test the rotor windings for a ground or leakage to the iron core with a test lamp—in this case, a socket and lamp that plug into an outlet and have two wires connected in series with the lamp in the socket base, so that the lamp will light when the two wires are touched together. One wire is touched to the iron core and the other one is placed on both rings as in Fig. 4. The lamp does not light from either ring, so we assume the windings are free of grounds. If the wires are placed on the two rings, the lamp should light, which indicates that the winding is probably continuous.

The parts of the motor, excepting the wound section, should be well washed in gasoline and wiped with a cloth until dry. The bearings are bronze bushings. While a well-lubricated sleeve bearing should wear for a long period, (Continued on page 128)

Fig. 2. The sections of the motor are then taken apart and the brass rings cleaned

until the contact rings are very smooth.

Open the centrifugal switch, which is located just back of the brass rings, with a screw driver for checking. The curved contact surfaces should be cleaned, if necessary, and the spring tension checked. If the parts appear dirty or gummy, clean them carefully

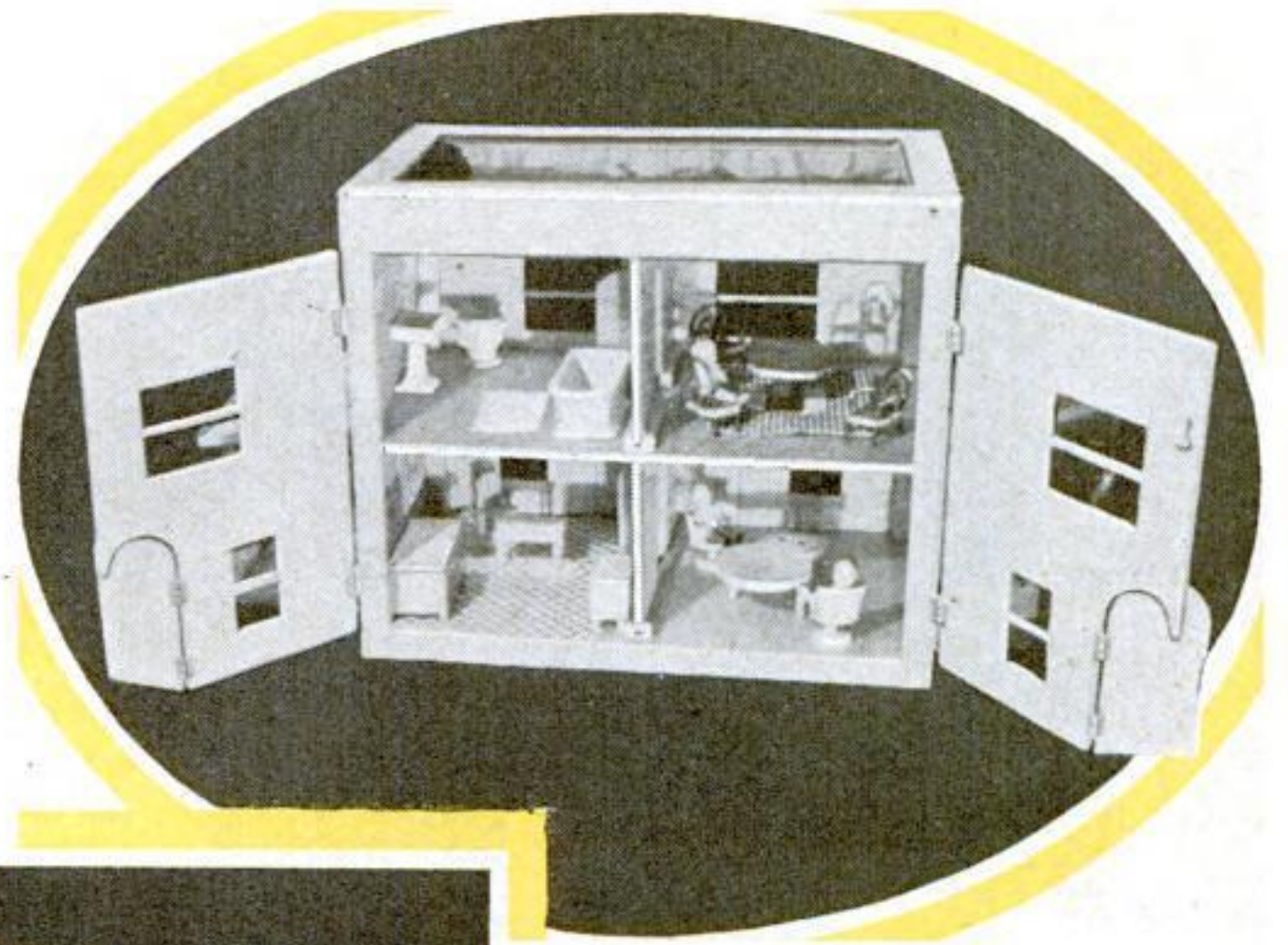
Fig. 3. Reversing rotation of motor by interchanging two of the wires

Modern Doll House

FOLDS FLAT FOR STORAGE



Built almost entirely of fir plywood, the house is simple and inexpensive to construct



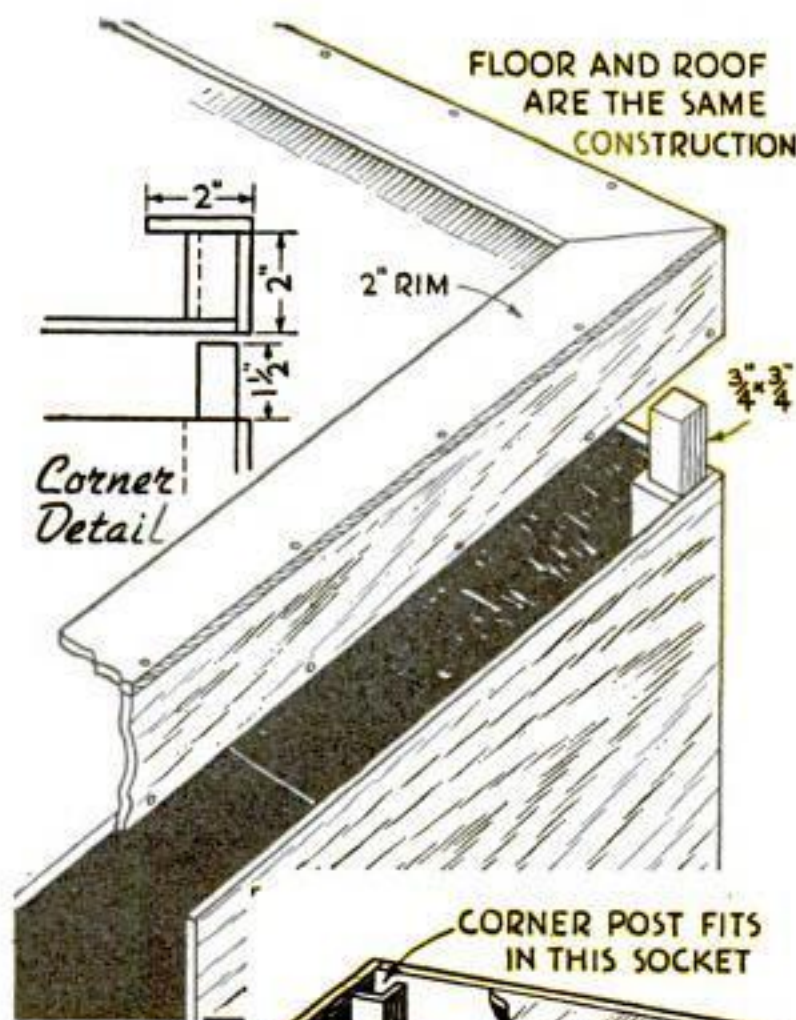
By
W. J. GEE, JR.

MANY city dwellers live in small apartments where a good-sized doll house cannot conveniently be stored when not in use. To solve this difficulty, I developed what may be called a "prefabricated doll house." Assembled, it is 18 in. high, 20½ in. long, and 12½ in. wide, yet it may be folded to fit into a cardboard suit box.

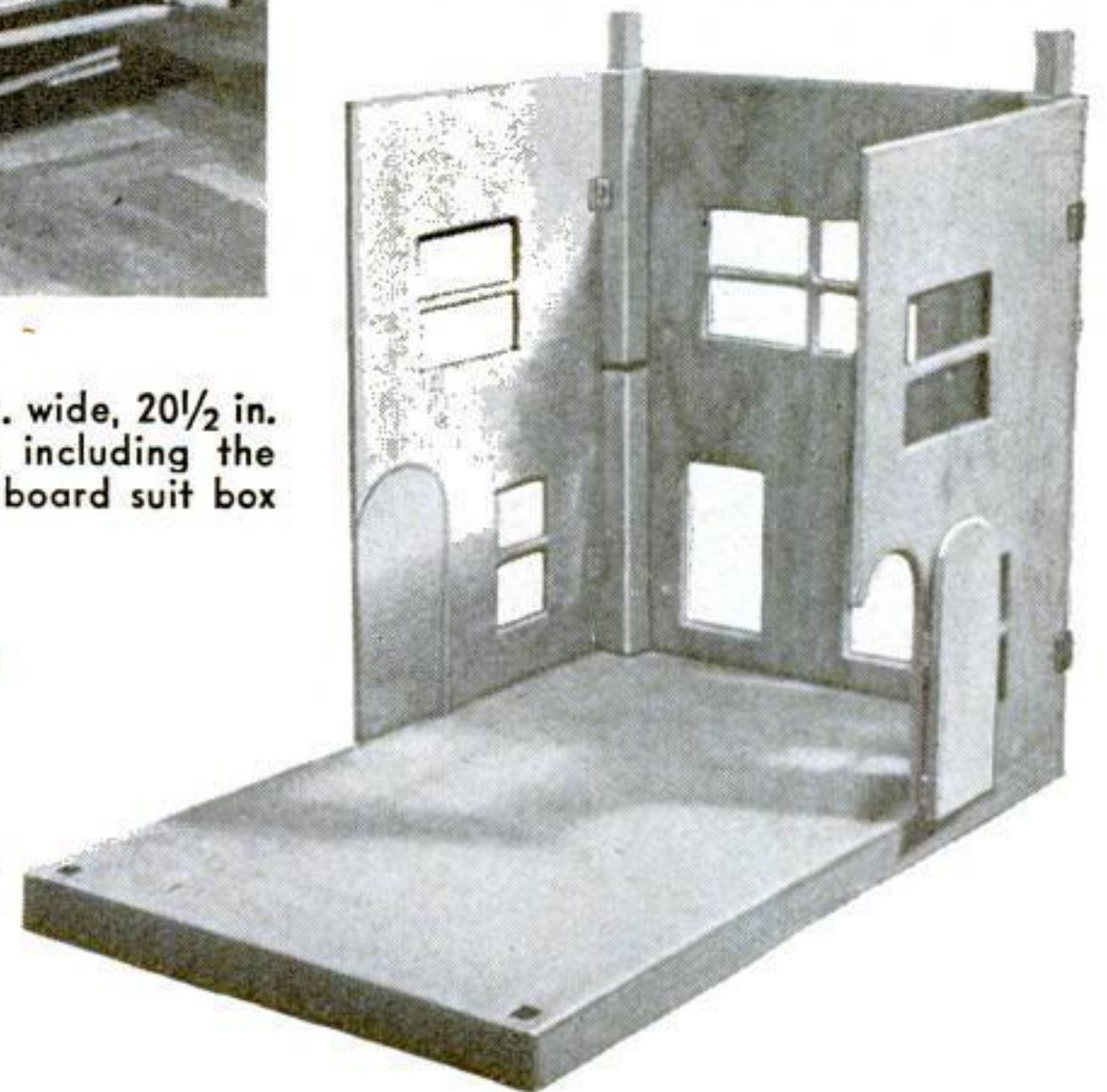
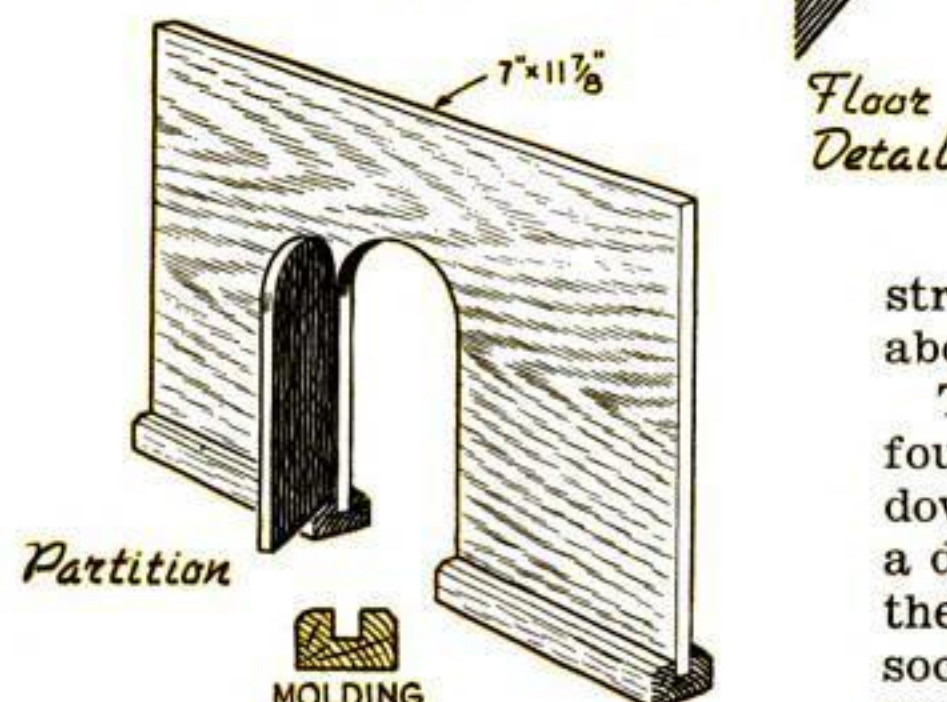
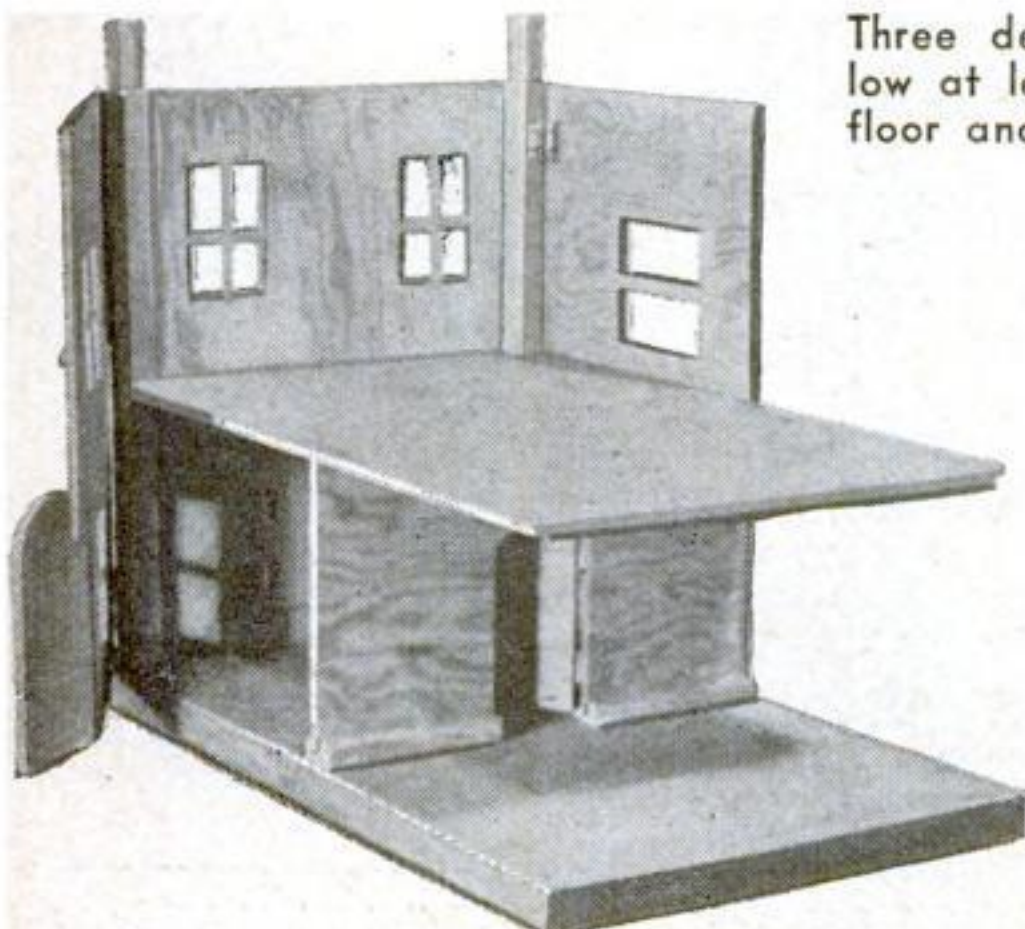
With the exception of the four upright corner posts and some minor parts, the house is made of ¼-in. Douglas fir plywood, of which 18½ sq. ft. are required, allowing for about ten percent waste.

The size and architecture may be varied, but I chose a modern design because it conformed to the idea of prefabrication. Assuming that you wish to follow this plan, start the construction with the floor and the roof, for these two sections are alike in every detail but one. They are both 12 by 20 in. and

Although the main part of the house is 12½ in. wide, 20½ in. long, and 18 in. high, the whole structure, including the extra porches, folds up for storage in a cardboard suit box



Three details and, below at left, the second floor and one partition



The house with one side open as it appears when furnished. Below, one of the two identical end sections

notched out ¾ in. square at the corners. While cutting these two pieces, make a third piece exactly the same to be used later for the second-story floor. Plywood trim 1 in. wide should be placed all around the floor, and a similar piece 2 in. wide around the roof, as shown.

The eight sockets for the corner posts are simply pieces of solid material about 1¼ in. square and the same height as the trim in each case. They are notched out ¾ in. square.

The roof differs from the floor only in the fact that it has a 2-in. wide trimming piece mitered horizontally around the top edge of the other 2-in. strips, as indicated, to conceal the sockets from above.

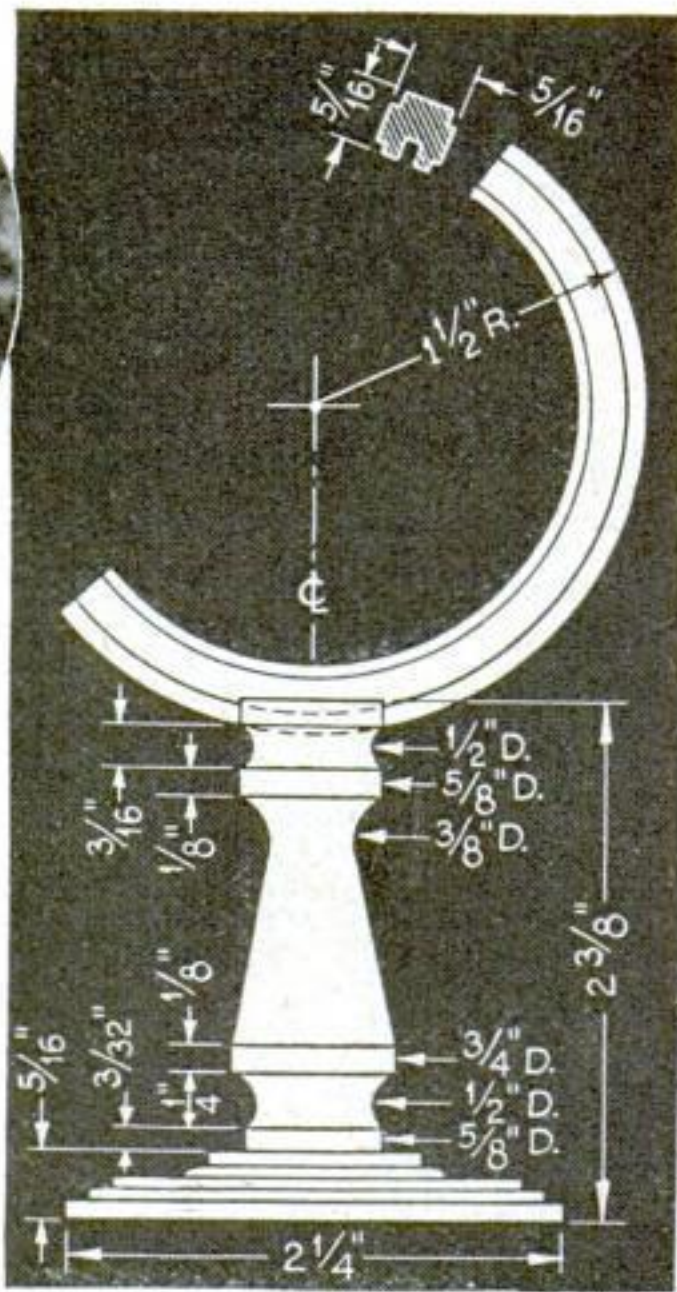
The two ends are identical. Start with the four posts, 1 in. square and 17½ in. long. Cut down the ends on two sides to ¾ in. square for a distance of 1½ in. from the top and 1 in. from the bottom so the posts will fit into the corner sockets. Exactly in the center of these posts, measuring from inside (Continued on page 118)

Small Photo Frame

TURNED FROM PEWTER OR WOOD



The finished pewter frame and, at right, the working drawing



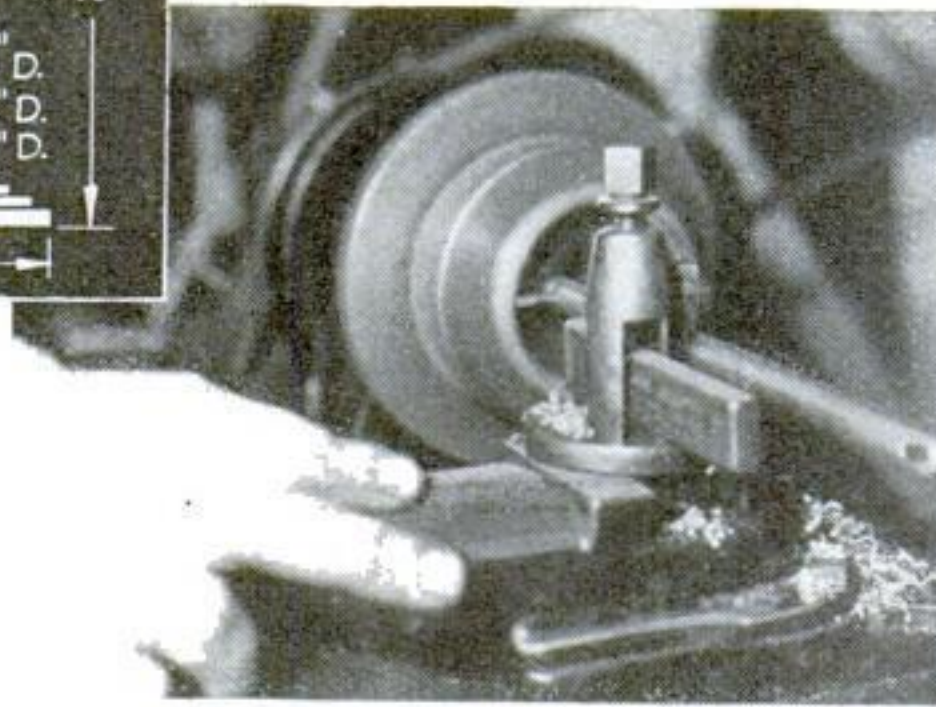
chuck. It is then turned over and finished on the top surface. The post is turned between centers with a dowel end on the bottom to fit in a hole in the base.

For the top member, a casting is prepared in a ring mold turned in a piece of wood. The cast ring is placed in the chuck with the jaws on the outside, and the inside is then turned to size. The groove for the picture is made with a very thin cutting-off tool, or a tool improvised from a worn-out file. After the inside

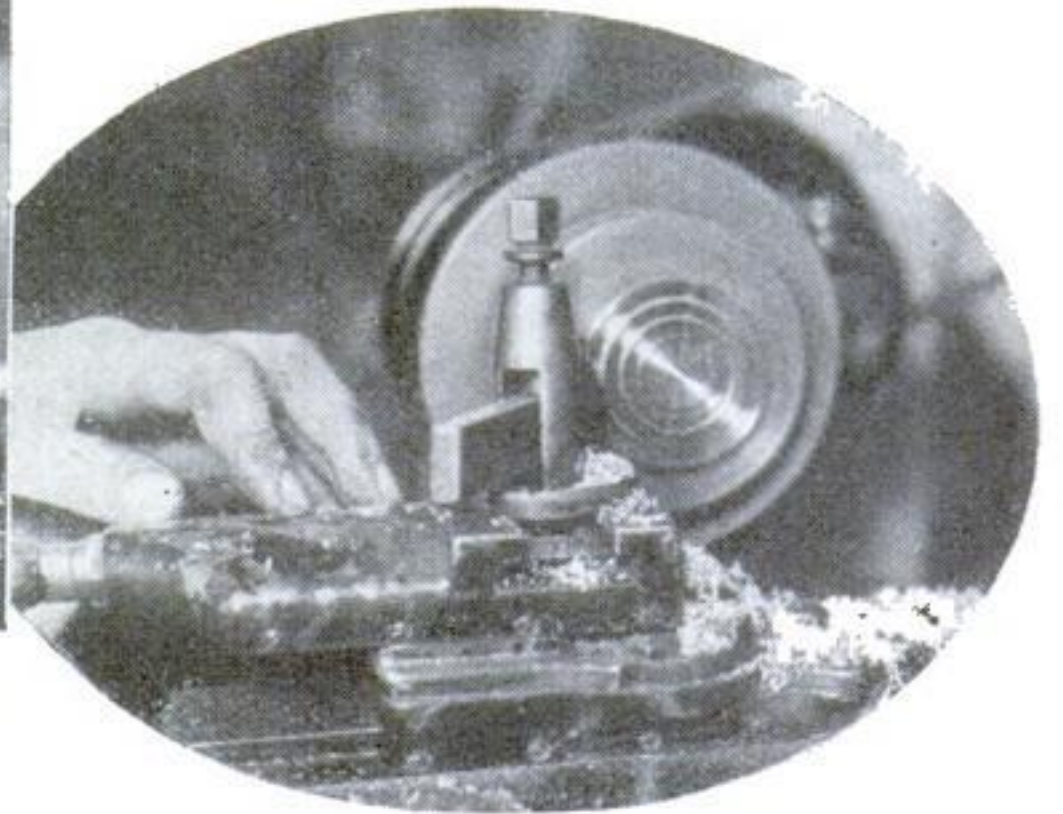
is finished, the ring is gripped in the chuck with the jaws on the inside, the metal being protected by pieces of soft copper or lead. It is finally polished with very fine garnet paper or fine steel wool and oil.

The post should be a press fit in the hole in the base, and a slot is cut in the top of the post to fit the ring. A section is cut from the ring so a picture may be inserted in the groove as shown. The ring is then soldered into the slot.

For use on a dresser desk, the frames are best made in pairs. When turned from wood, they are constructed in much the same manner, but the ring is made a little wider. Finish them to match the furniture on which they are to be placed.—D.M.



Turning the groove in the ring to hold the picture and, in oval, machining top of base



EITHER pewter or hardwood may be used for making this small modern-looking photo frame. If pewter is used, the castings are made in wooden molds and finished on a small engine lathe or on a wood lathe equipped for cutting metal.

The base is first machined off on the bottom with the casting held in the

Turning the groove in the ring to hold the picture and, in oval, machining top of base

Alarm Clock Opens Furnace Draft

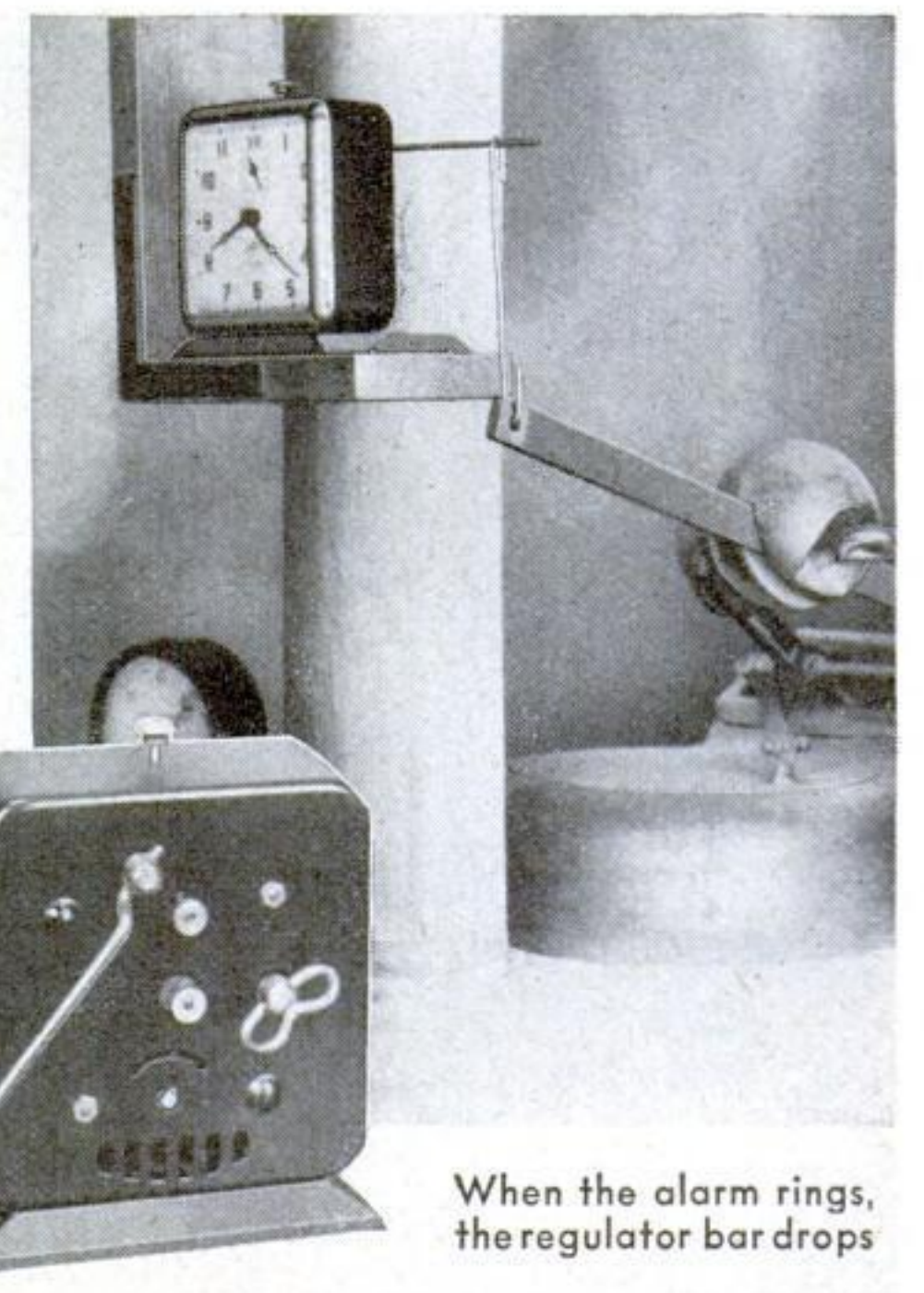
ONE of the simplest ways to rig up an alarm-clock type of furnace control for turning up the draft on an ordinary coal-burning heating plant is shown in the accompanying photographs.

The mechanism of an alarm clock of the type illustrated is removed from the case, and the alarm-winding spring is cut away with snips. The alarm bell is also removed. Next the ratchet and pawl on the alarm-winding shaft are soldered up or fastened with a machine screw and nut, otherwise it would be difficult to screw the winding key on and off the shaft. The works may then be replaced in the case.

Remove the ring or handle from the alarm-winding key and attach a rod about 5 in. long in its place after bending an offset in the rod to enable the key to be screwed onto the shaft.

A wooden shelf is fastened over the furnace in about the position illustrated, and clips are provided to hold the clock firmly, yet allow it to be removed for winding and setting. The connection between the balance bar or regulator of the furnace and the rod extending from the clock is merely a piece of wire bent at each end in the shape of a hook, as shown. At night the clock is wound and

set so that the alarm mechanism will operate at the required time, which may be as much as two hours before heat is required throughout the house in the morning. This has to be found by experiment.—ARMISTEAD WHARTON.

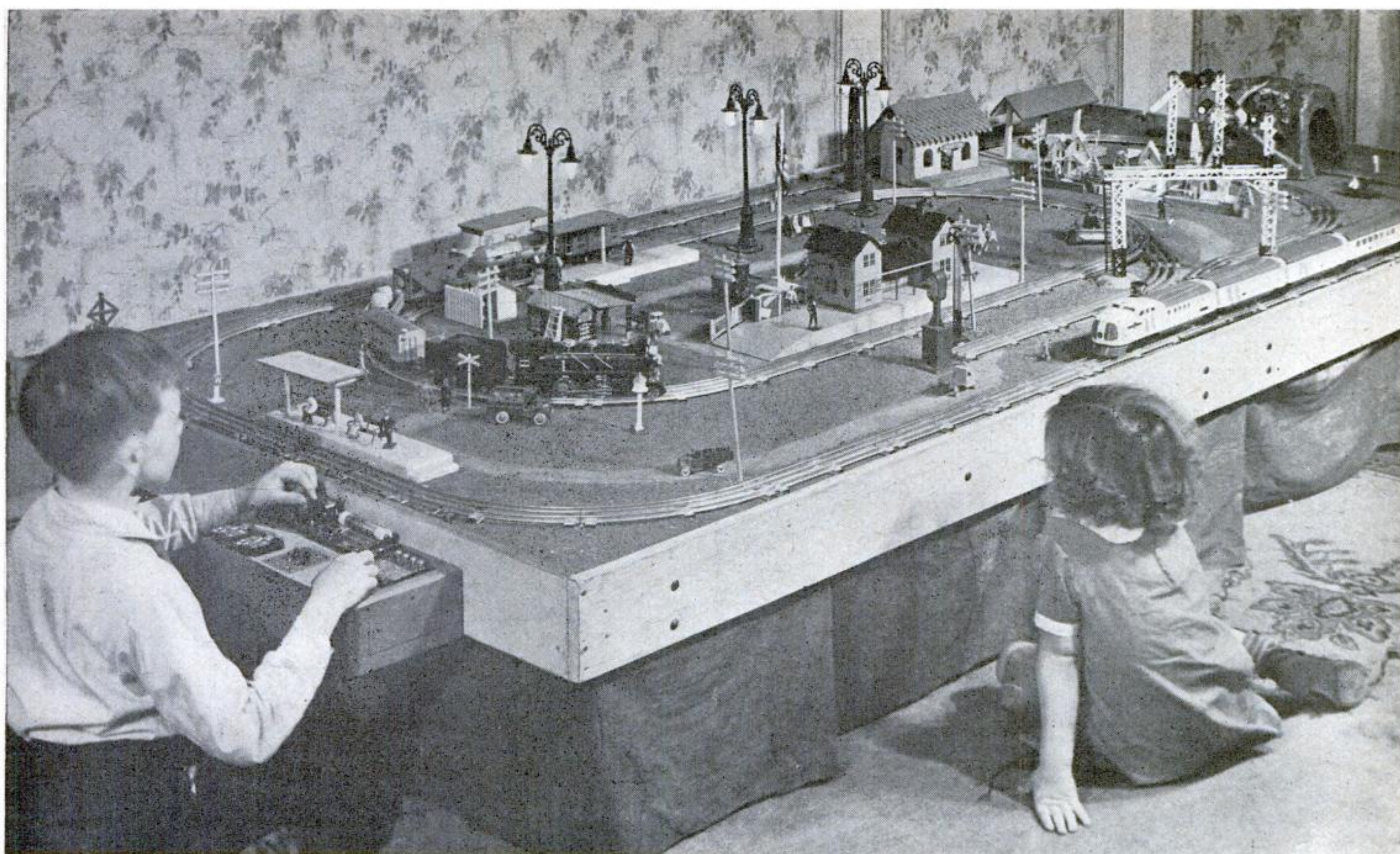


When the alarm rings, the regulator bar drops



Bicycle Pump Sets Off Big Tin-Can Popgun

A NOVELTY noise maker that works like a huge popgun may be made from an empty tin can with a tight-fitting friction top. A hole is punched in the bottom of the can to receive a valve stem from an old bicycle inner tube, which is screwed tightly in place. When the cover is put on and air is forced into the can by means of a bicycle pump, the cover flies off with a loud report.—NORVAL WRIGHT.



The two sections of the platform are joined into one unit by the long aprons, which are bolted to the frames

Take-Down Platform

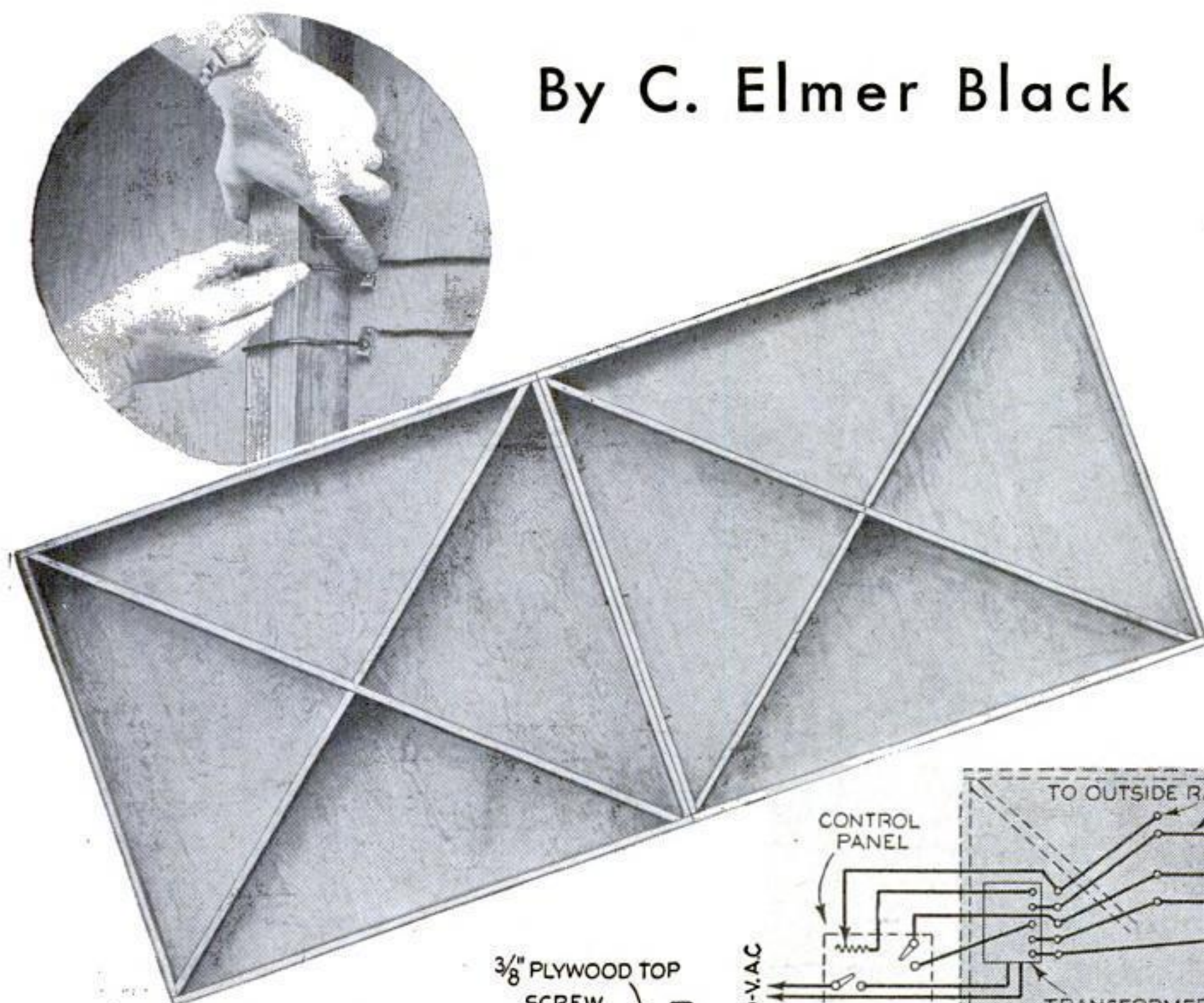
FOR DISPLAYING MODEL RAILWAY AT CHRISTMAS

By C. Elmer Black

DESIGNED for those who set up a temporary model-railroad display each year during the Christmas season, this portable platform contains a basic wiring system that will take care of any train-system hook-up.

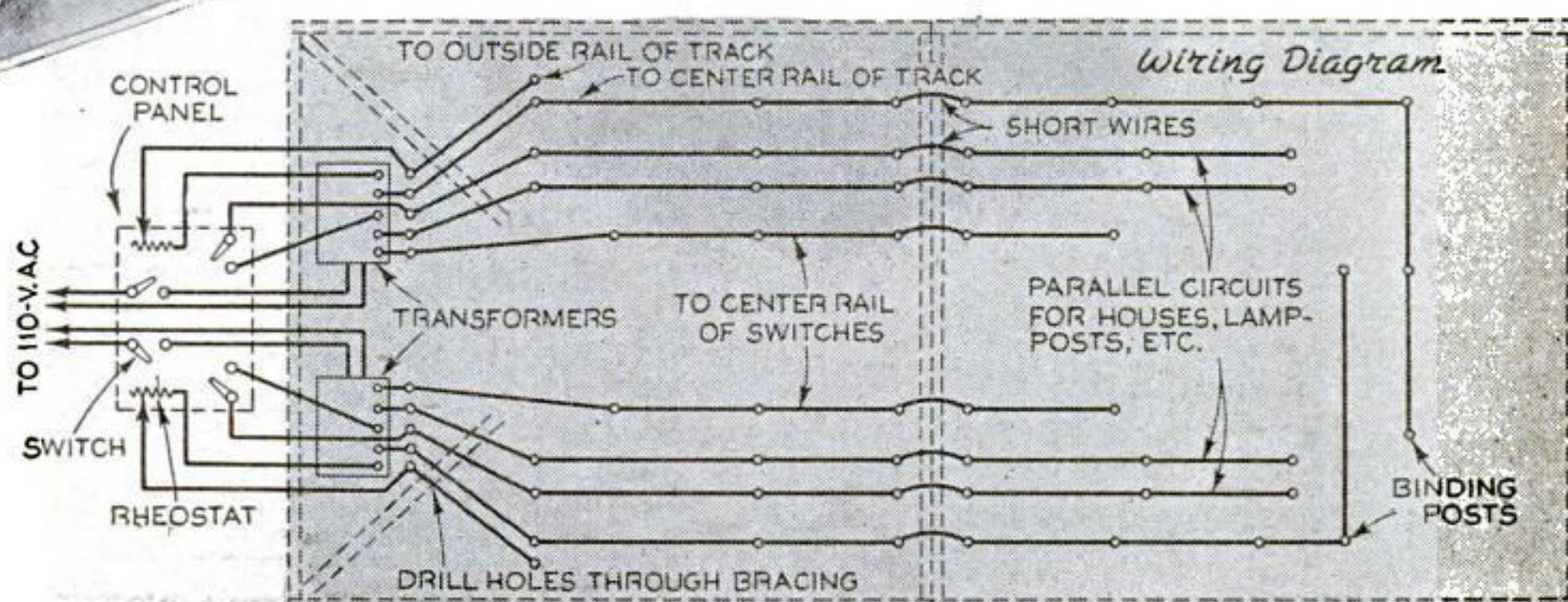
Screw each section of fir plywood to a wood framework made from 13/16 by 3 1/2-in. well-seasoned pine strips, using 1 1/2-in. No. 7 flathead wood screws. Where the bracing strips cross each other in the center, fit a lap joint and hold together with a 2 1/2-in. No. 7 screw.

Place the sections together, upside down, on sawhorses. Clamp adjacent sides so the tops of both sections are flush, and bore three equally spaced holes to take 1/4-in. carriage bolts 2 1/2 in. long. With a tightly stretched string, level up the ends of the sections and fit strips of 13/16 by 6-in. pine around the whole, letting them project 1 in. above the (Continued on page 114)



The braced underside. In circle, short wires make connections across the center joint. Right, how apron is bolted to sidepieces, and wiring diagram

3/8" PLYWOOD TOP
SCREW
WASHER
1/4" x 2 1/2"
CARRIAGE
BOLT
SIDEPIECE
6" WIDE APRON
Section



Looking at BACTERIA



**Invisible Plants That Destroy Human Life,
and at the Same Time Make Life Possible,
Provide Fascinating Subjects for Study**

By MORTON C. WALLING

DESTROYING life wherever they can, yet making much life possible, bacteria are among the most fascinating of all the minute things on which to turn your microscope. These infinitesimal objects, classified by science as plants, are essential to innumerable forms of life. For even while bacteria are spoiling our food, they are busy manufacturing chemicals necessary to natural food production; and while they are causing the most deadly diseases that afflict mankind, they are preventing disease from wiping man from the face of the earth. They are at once among our best friends and our worst enemies.

Biologists liken them in respects to fungi. They are close relatives of the algæ. Often you will hear them referred to as germs or microbes. Strictly speaking, however, "bacteria" is the proper name for them. Although some diseases, malaria for instance, are caused by tiny animals called protozoans, the majority of our most familiar and most dangerous illnesses are the result of poisons produced by bacteria growing in our bodies.

For detailed study of bacteria, a high-grade microscope having a substage condenser and oil-immersion objective lens, and magnifying 1,000 diameters, is desirable. However, it is entirely possible to see the larger bacteria at magnifications of a few hundred diameters with the better grade of amateur microscopes, although considerable patience may be required in preparing the specimens, arranging illumination, and focusing.

It is well to insert a warning here: Disease-causing bacteria can be more dangerous than T.N.T., if improperly handled. The pathogenic kind cause diseases like diphtheria, tuberculosis, and boils. Fortunately, there are enough harmless bacteria available to make it unnecessary for the amateur microscopist to experiment with the dangerous ones. Because of the possibility of unintentionally raising a crop of deadly microorganisms, you should not undertake the culture of bacteria unless you are working under a competent instructor. Likewise, do not attempt to make slides of bacteria from sores, the mouths of diseased persons, or other infected sources.

You carry with you, wherever you go, billions of bacteria upon which you can draw for specimens. They are, for example, in your mouth. To obtain a supply, scrape the inside of your cheek or the surface of your teeth with a clean fingernail or the broad end of a toothpick, and transfer the accumulated material to a slide, to be treated as described presently. Other sources of bacteria for study include stagnant water, the water from hay infusions, manure and other animal excreta, buttermilk, sour milk, sweet milk (whether pasteurized or not), and soil from the garden. Usually you can obtain a considerable collection simply by touching the tip of your tongue to a clean slide.

The ability to see bacteria well depends largely on the preparation of mounts, particularly

If your instrument is not fitted with a substage diaphragm, you can improvise one that will improve its performance considerably



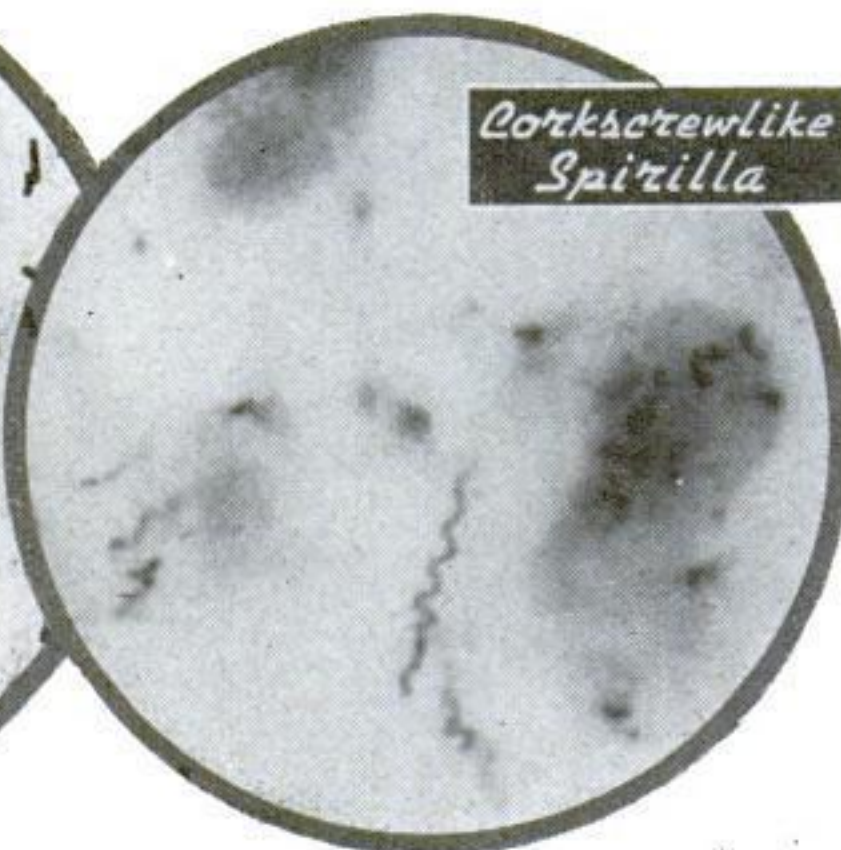
*Ball-like
Cocci*

THREE KINDS OF BACTERIA

Here are examples of the three general types of bacteria, as seen by the microscope. Each of these groups has many subdivisions



*Rod-shaped
Bacilli*

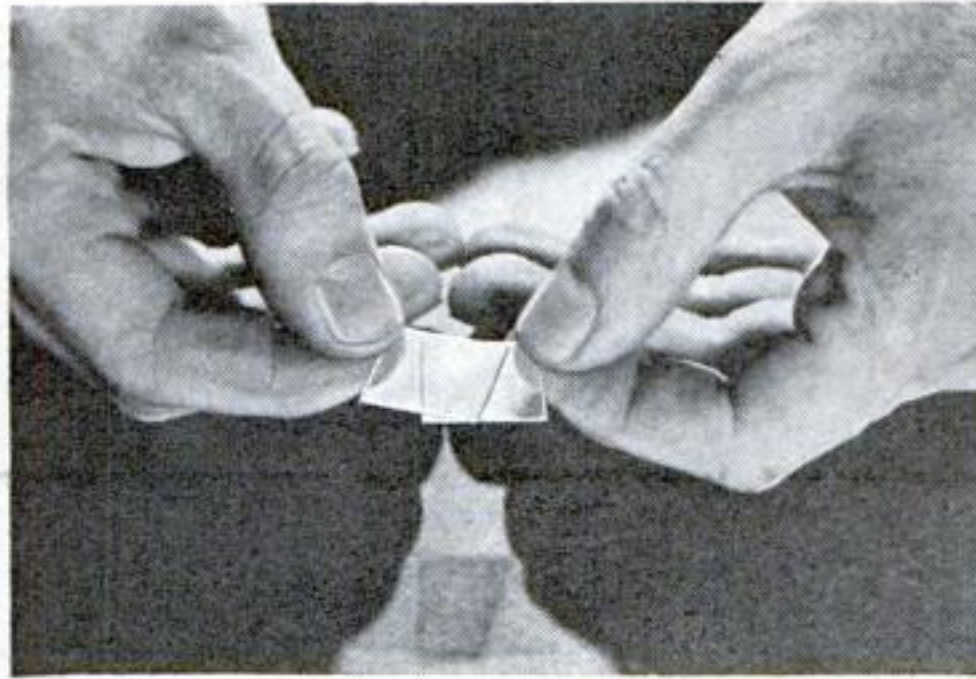


*Corkscrewlike
Spirilla*

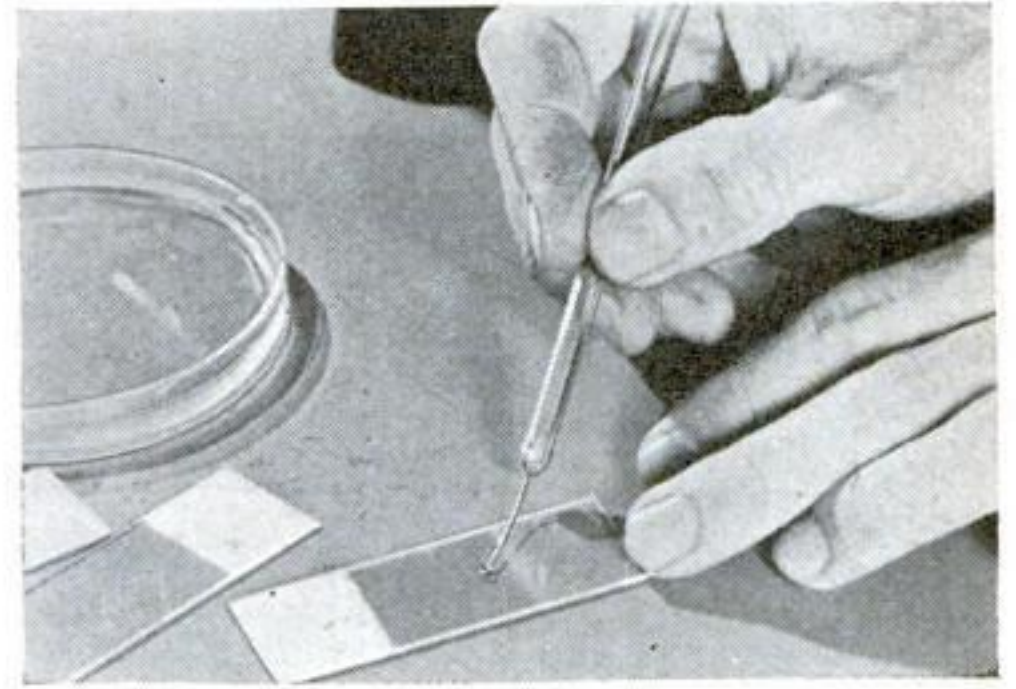
Through Your Microscope



Several forms of bacteria from the human mouth. Note the odd chainlike pattern

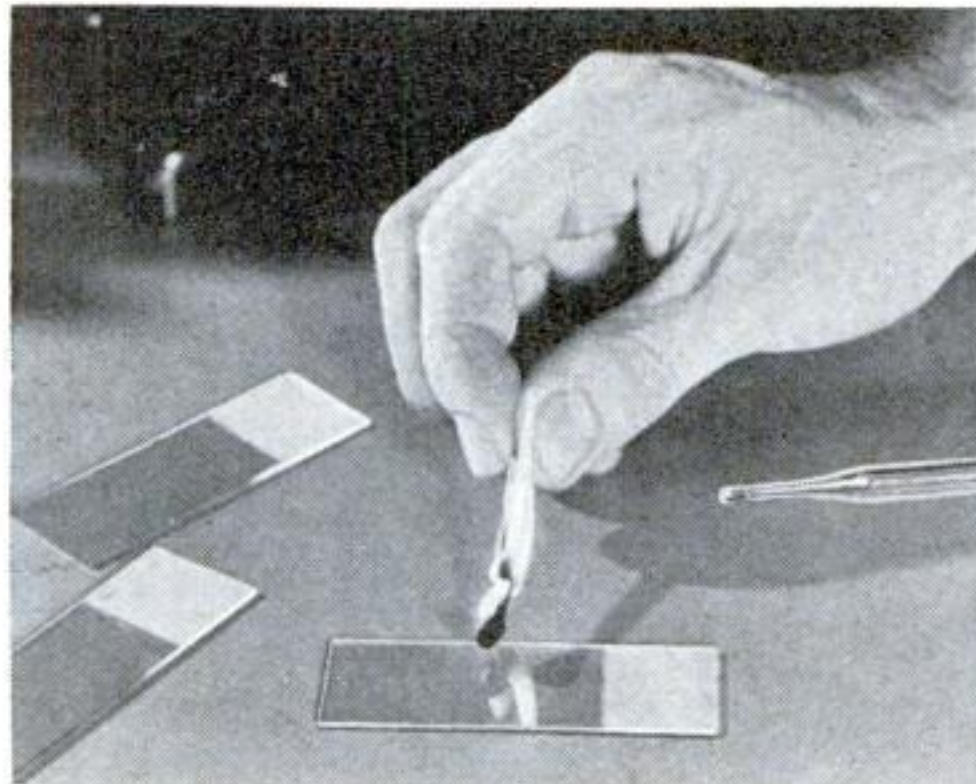


1 Liquid containing specimens can be spread by rubbing it between two pieces of glass

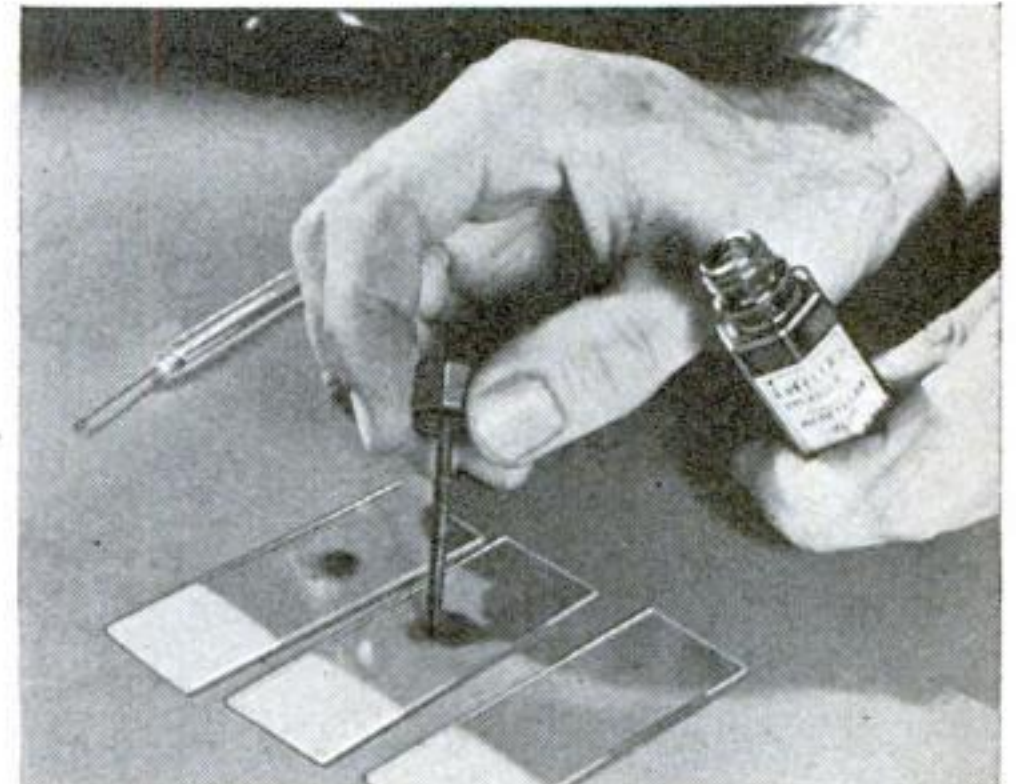


2 Another way is to smear it directly on a clean slide with the aid of a wire loop

3 To kill the tiny plants, burn a few drops of alcohol over them, as illustrated below



4 A stain is applied with a medicine dropper to make the details stand out more clearly



their staining. Some workers spread them in a thin film on thin cover glasses which later are inverted and mounted on slides. Others mount them directly on slides, and may or may not protect the preparation with a cover glass.

First of all, have your slides and cover glasses absolutely clean. Scour them thoroughly and wipe them with a soft, greaseless cloth such as a Turkish towel or some similar material.

Your bacteria will be either suspended in a liquid, or in the form of a solid. If a solid, convert the material into a liquid suspension by dissolving some of it in distilled water, or in a normal saline solution—six-tenths percent table-salt solution in water. Spread the liquid in a thin, uniform film. If you are using the cover-glass method, place a drop of the preparation on a clean cover glass, bring a second cover glass into contact with it, and immediately draw them apart with a sidewise, sliding motion. With a little practice, you can produce thin, even films. You then have two cover glasses containing the specimen. You can hold the glasses in your fingers, although most workers who use this method prefer to hold them with cover-glass tweezers. When making a preparation directly on the slide, pick up a small drop of the bacteria-laden liquid with a wire loop—platinum usually is used—and transfer it to the center of the slide. With the loop, spread it in a thin film. If the slide is perfectly clean, this will be done easily. Let the film dry by evaporation.

You are now ready to fix the bacteria—to kill them and preserve their form. There are a number of ways of doing

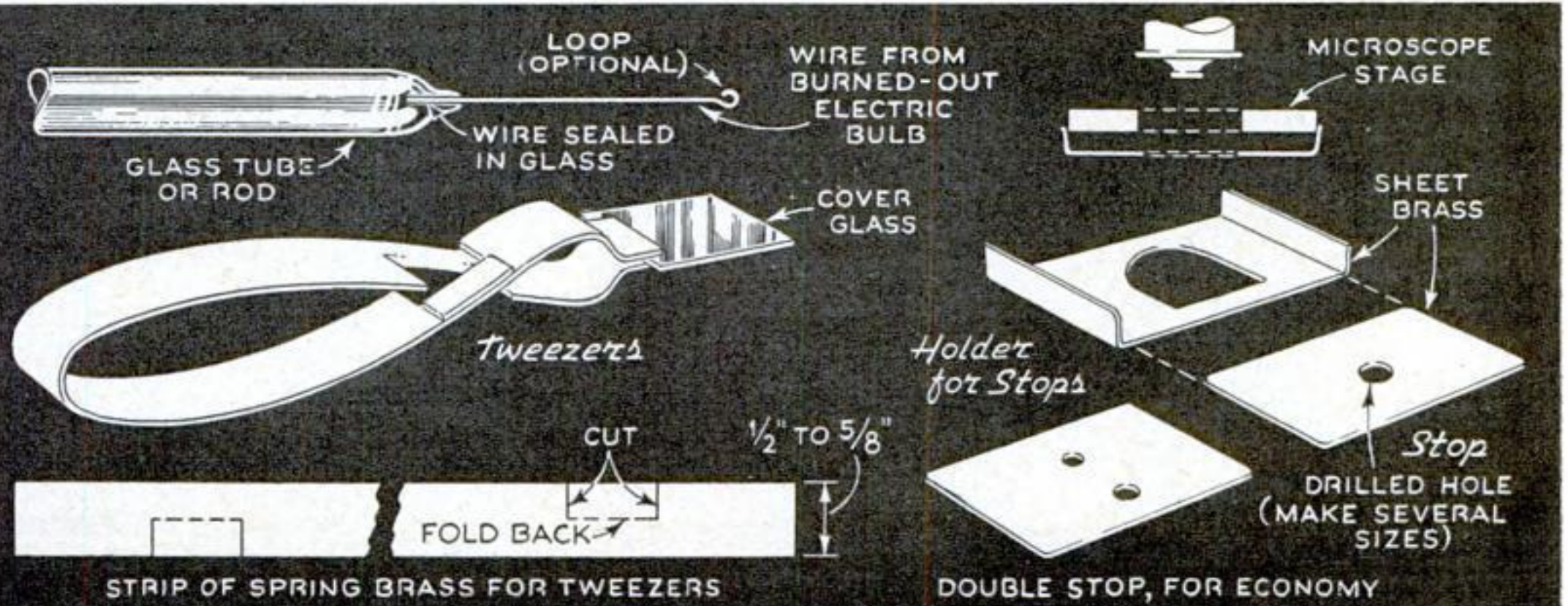
5 After rinsing, a cover glass may be added if desired, and sealed with Canada balsam



this, but only the more common ones will be described. A widely used method is known as flaming. The cover glass or slide is passed rapidly through the tip of a gas or alcohol flame three or four times. Each (Continued on page 135)

SOME HANDY ACCESSORIES FOR YOUR MICROSCOPE

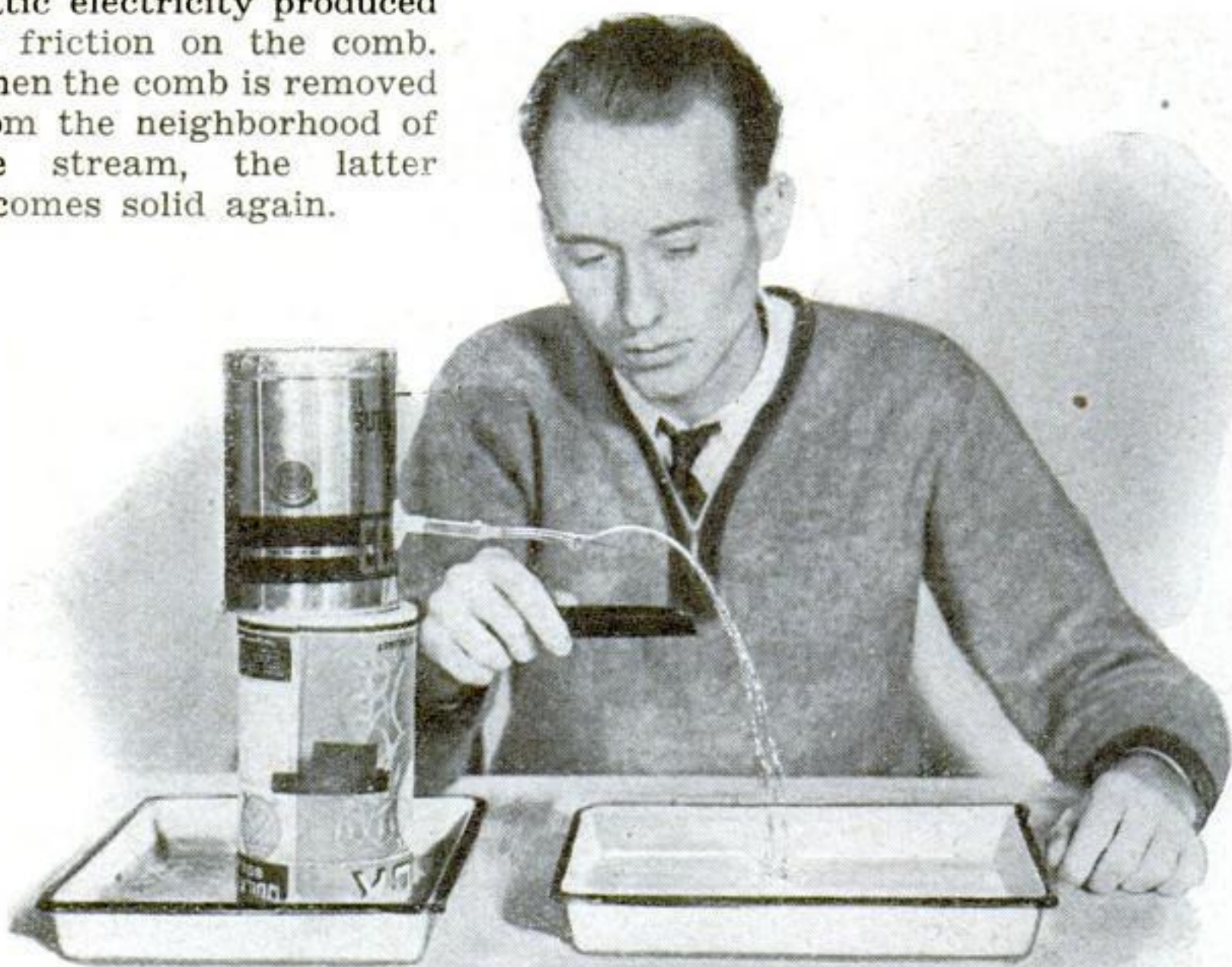
Useful in working with bacteria, the three easily made tools illustrated here also will prove to be convenient for many other kinds of amateur microscope study. The wire loop set in a glass handle is ideal for transferring specimens to slides. Tweezers made of spring brass grip cover glasses securely. The simple substage diaphragm increases image contrast



NOVEL TESTS OF Scientific Laws

Static Charge Breaks Stream of Water

RUB a hard-rubber comb, or a stick of sealing wax, briskly with a woolen cloth and hold it near a fine stream of water. The solid stream will break immediately into a spray, the water particles repelling each other as they become charged by induction from the static electricity produced by friction on the comb. When the comb is removed from the neighborhood of the stream, the latter becomes solid again.



Simple Direction Finder Locates Source of Sound

A SIMPLE direction finder for sound waves can be made with rubber tubes and paper funnels, as shown above. By placing the ends of the tubes to your ears and turning the apparatus until the sound is equally loud in both ears, you can find the direction of a ticking clock or other source of sound.



You Can Hear Through Your Teeth

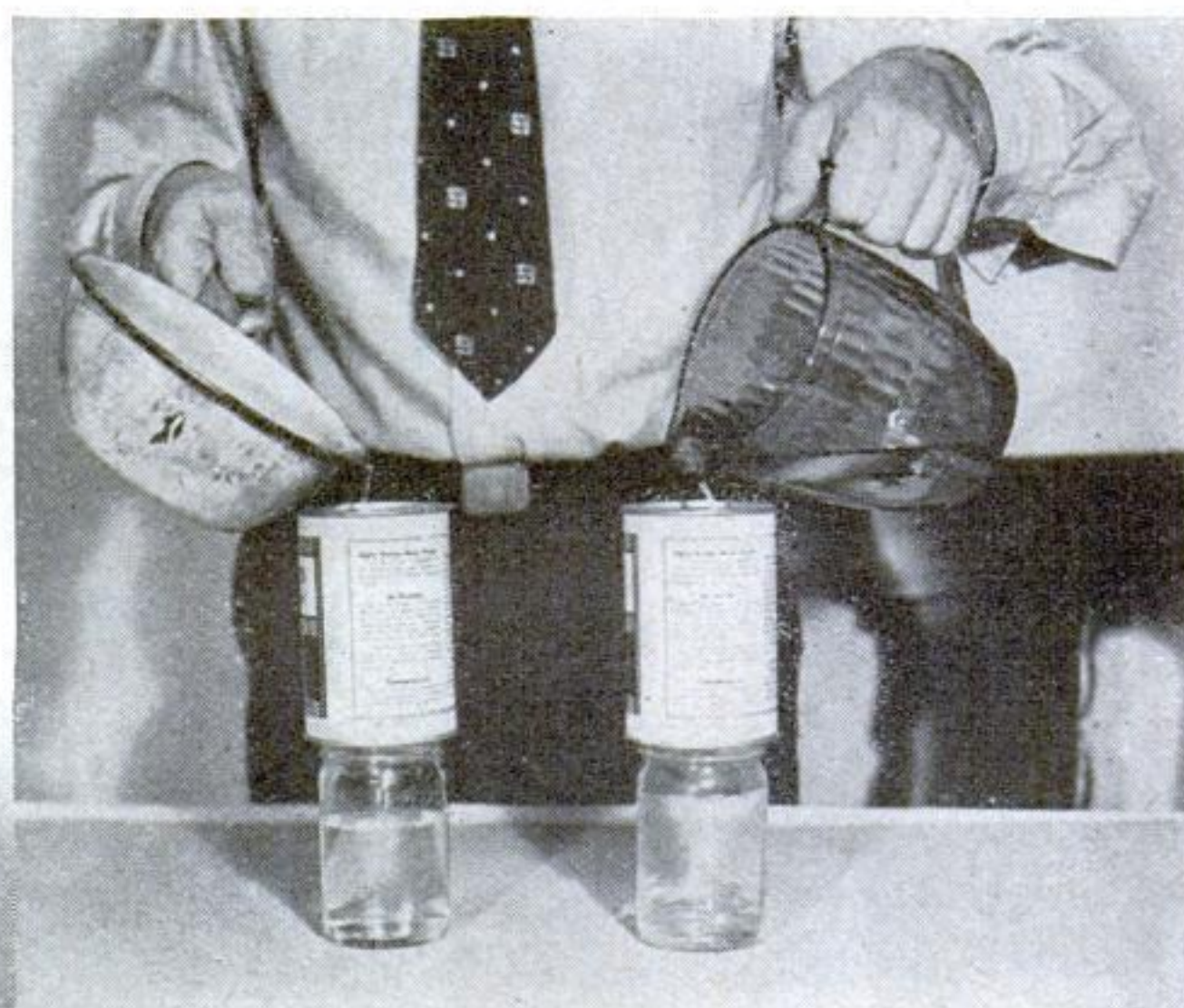
HEARING aids of the bone-conduction type use a receiver in contact with the skull. To see how this works, strike a fork against a table and, when the sound has almost died away, place the handle between your teeth. The tone produced by the vibrating tines will be heard distinctly.



Why Hot Water Leaks Faster Than Cold

MAKE a needle-size hole in the bottom of each of two similar tin cans, and set them over glass jars as shown below. Fill them simultaneously, one with boiling water and the other with ice water. The cold water will drip slowly into its jar, while the hot water will spurt in a steady stream. As they approach the

same temperature, their speeds will vary accordingly. Molecules hang together less closely in hot than in cold water, thus flowing more freely.

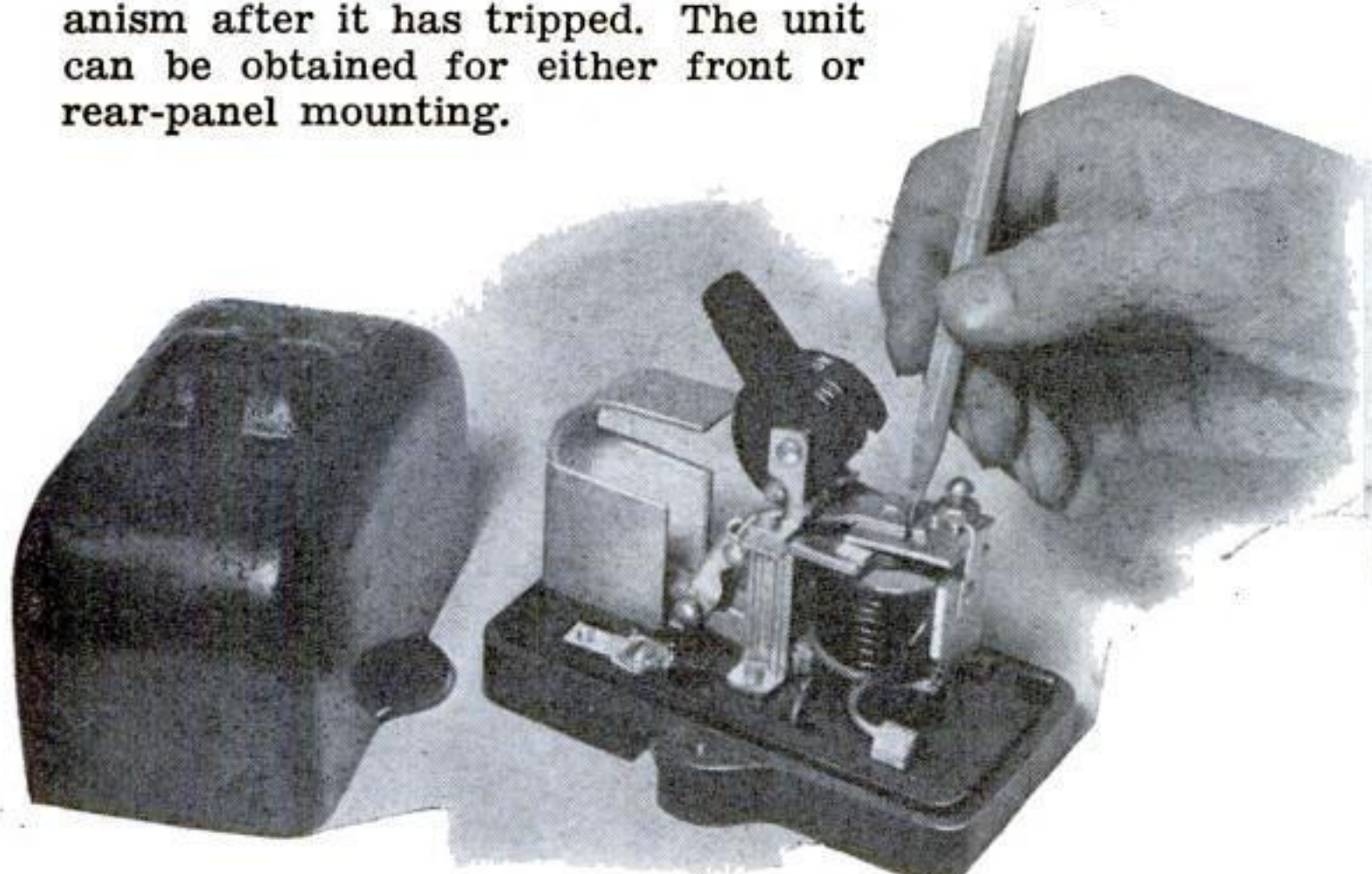


How Orange Light Cuts Fog

IN A darkened room, look at a newspaper through soapy water illuminated by a flash light. Place an orange-colored film over the lens and the printing will be easier to read. Blue and green waves are broken up and reflected; red and yellow waves pass through.

Circuit Breaker for Amateur Use

COMPACT and inexpensive, a new circuit breaker makes it possible for the amateur to provide complete protection against overloading and short circuits for his short-wave transmitter. It is available in sizes ranging from fifty milliamperes to thirty-five amperes and can be obtained to break the circuit instantaneously or after a time delay. The knob projecting from the breaker housing serves both as a handy toggle switch and as a lever for resetting the mechanism after it has tripped. The unit can be obtained for either front or rear-panel mounting.



The breaker with its housing removed. Pencil points to trigger



Electric Blower Cleans Receivers

MIDGET receivers can be cleaned easily with a new electric blower. Equipped with a flexible rubber nozzle, its air blast can be directed into any out-of-the-way corner to remove the dust that collects on condensers and similar parts.

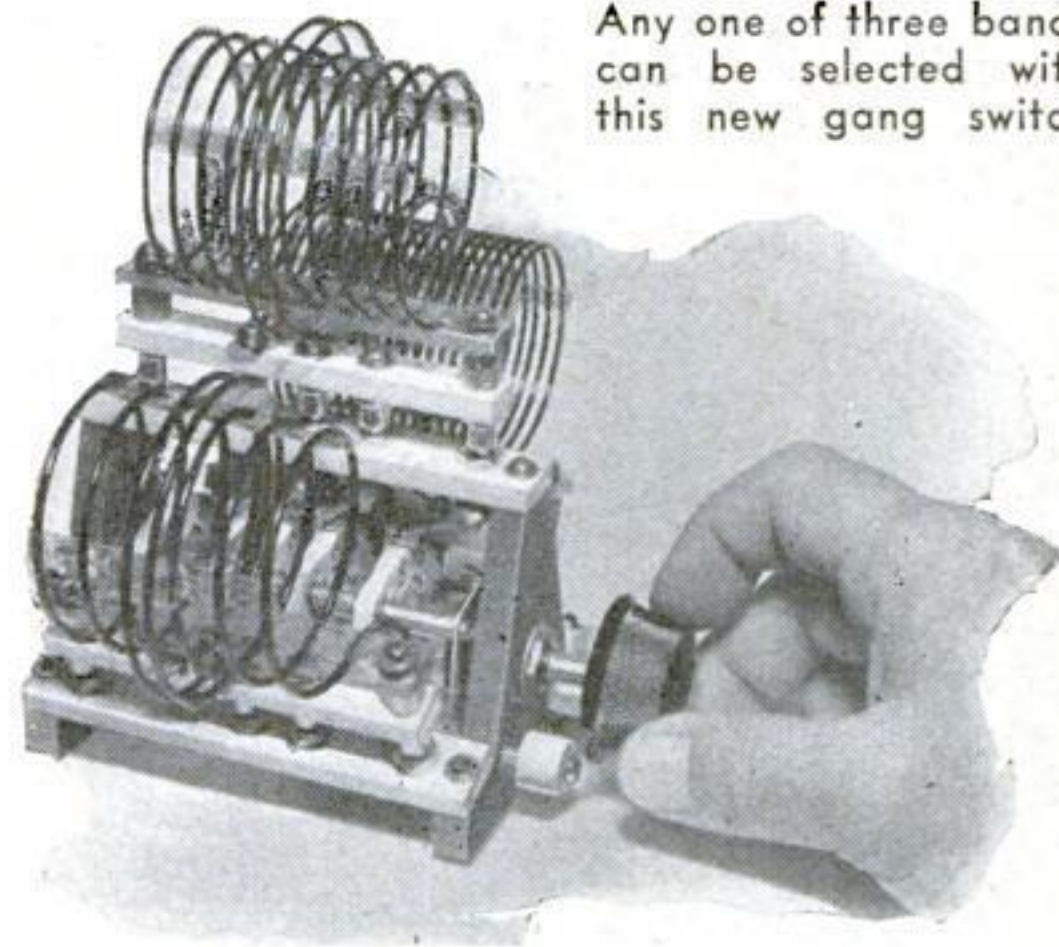
Microphone Fits Hand

HERE is an unusually light and compact microphone designed to fit in the palm of the hand. Especially suited for use by transmitting amateurs and public speakers, it is equally valuable for experimental, field, and portable work. The new midget unit, which is small enough to be carried in a coat pocket, is available in both crystal and carbon models.



Coil Turret for Transmitters Makes Band Switching Easy

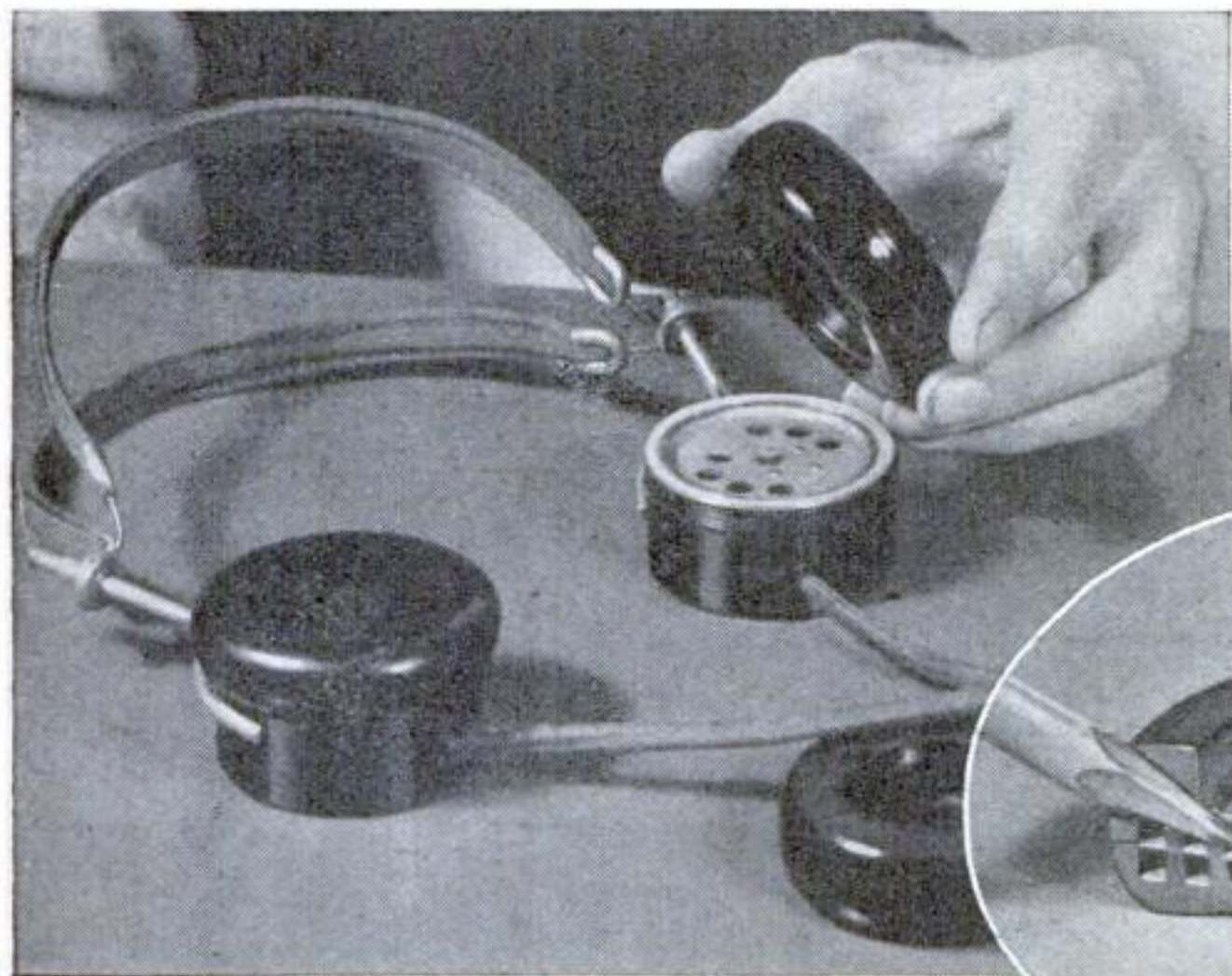
Any one of three bands can be selected with this new gang switch



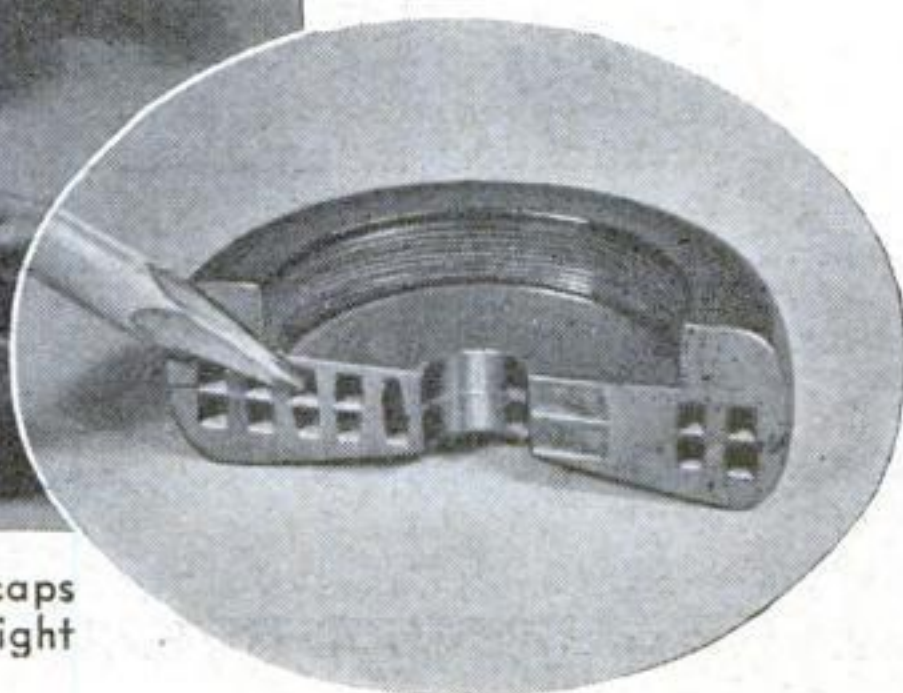
New-Type Caps Improve Earphone's Tone

In a radically new type of cap for earphones, a series of acoustically designed chambers or labyrinths are said to greatly improve the tone of ordinary reproducers. Available in a variety of sizes to fit existing types

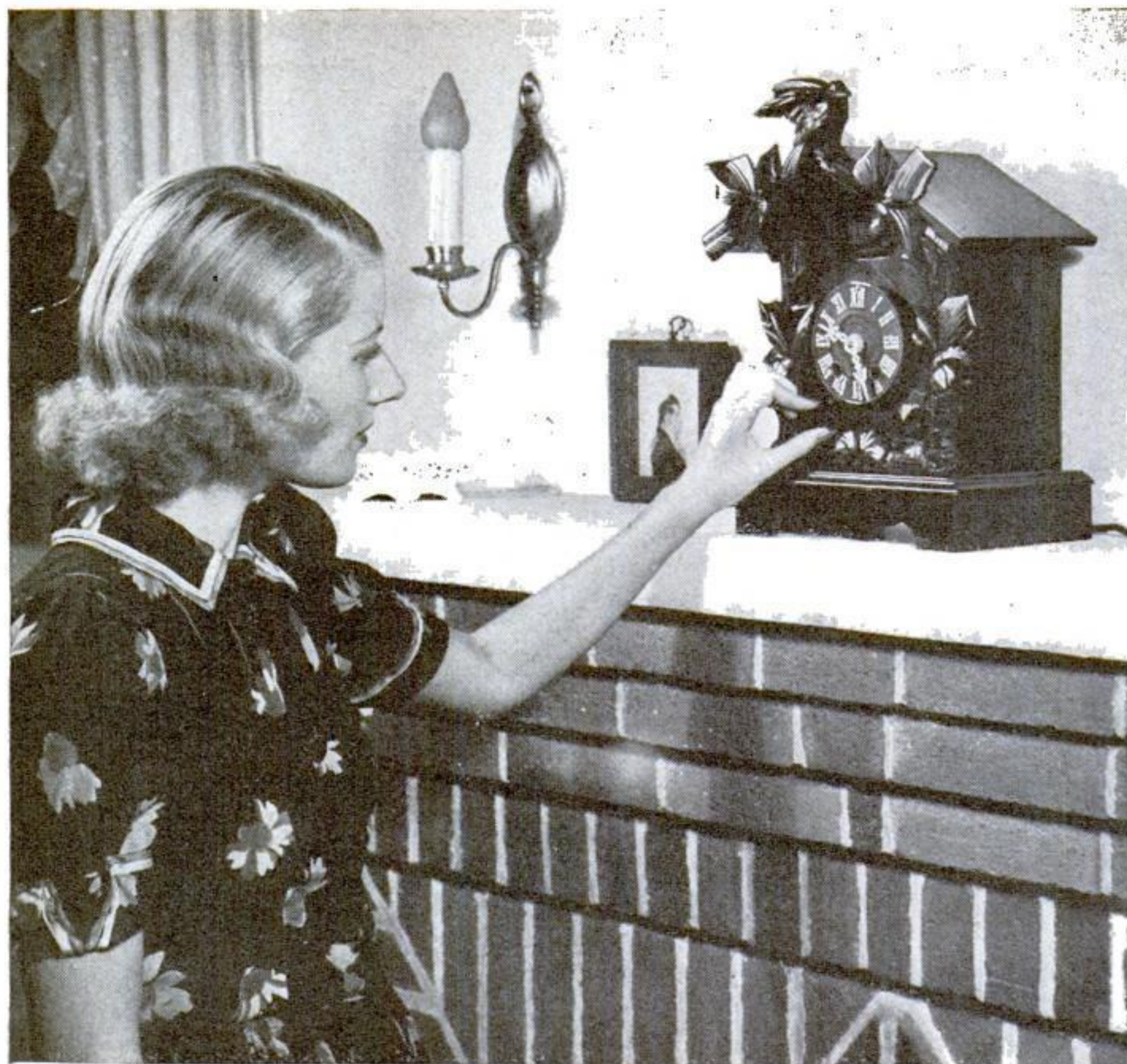
of headsets, the new caps not only increase the tonal range of a pair of earphones, but prevent rattling and distortion when high power is used. Functioning like the curved sound chambers in high-fidelity loudspeaker systems, the labyrinths provide air chambers that serve to damp, or hold down, the vibrations of the diaphragm to give a more even response over a greater range of frequencies.



Designed to fit existing earphones, these caps have built-in acoustical labyrinths as at right



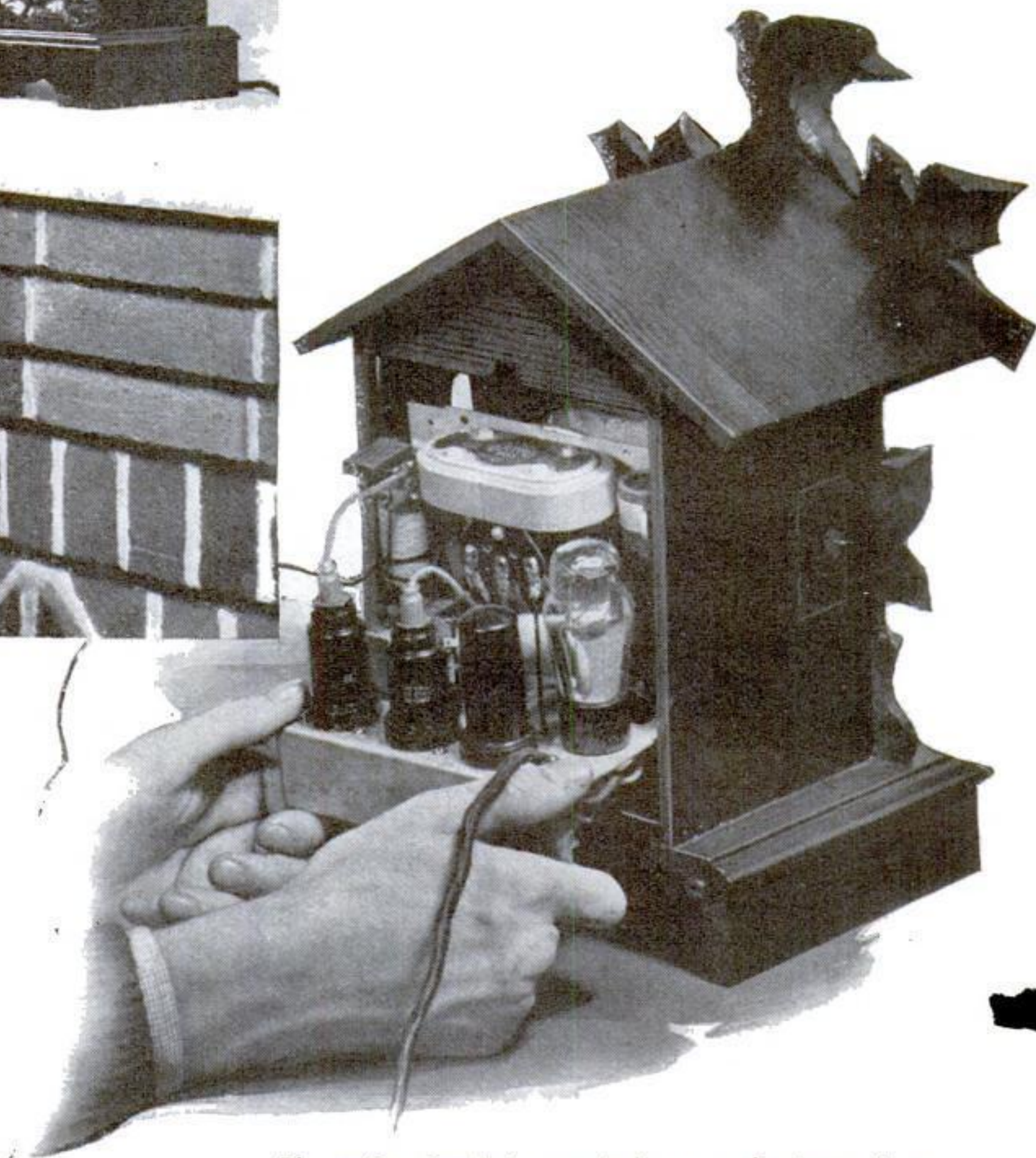
FOR THE radio fan who wants to be able to change the coils on his transmitter quickly and easily, the switching unit shown above will prove a convenient timesaver. Consisting of a special, positive-action, five-section switch, it can be used with single-ended, center-tapped, end-linked, and center-linked coils, and allows the rapid selection of any one of three separate transmitting bands. The assemblies, constructed for use in the exciter stages and final amplifiers of transmitters having a plate voltage that does not exceed 1,000 volts, are designed for convenient behind-the-panel mounting, two machine screws, fitted into short insulating supports on the front of the switch, serving to hold the unit in place. The coils, three in number, are of the plug-in variety so that they can be removed or replaced easily.



Here Is An Attractive
Receiver That Is Both
Novel and Inexpensive

By
CLARK MAXWELL

ANYONE CAN BUILD THIS Cuckoo- Clock RADIO



The entire circuit is mounted on an aluminum chassis that fits snugly inside the cuckoo-clock cabinet

WANTING attractiveness as well as utility and novelty in a new radio receiver I was designing, I spent considerable time looking around for something new in the way of cabinets. While rummaging around in my attic one day I ran across just the thing—an old cuckoo clock. The result is shown in the photographs on this page.

Generally speaking, cuckoo clocks are available in two designs—one to be hung on the wall, the other to be placed on a mantel. My clock happened to be the mantel type, but the same circuit could be mounted in a clock case of the wall variety.

After removing the clock works and measuring the inside of the case, I discovered that the space available was a bit too cramped to take the four-tube electric circuit I had planned. This was easily remedied, however, by adding an

inch of wood all around. Although this can be done easily at home by anyone owning a few woodworking tools, the reader who lacks a home workshop can take the clock to a cabinetmaker who will do the work for a dollar or so.

Very few additional alterations are necessary to convert the case into a radio cabinet. One of the most important is to supply an opening for the speaker, which is mounted on the front of the chassis. This is done by removing the clock's face, taking care not to damage the delicate hands and figures. Directly behind the face there should be a hole measuring about three inches in diameter. If there isn't, cut one with a fret saw or an expansion bit. It must be placed so that the speaker will fit squarely behind the opening when the chassis is in place. The face then can be refastened by mounting it on two dowel-rod supports so that it stands

away from the front surface of the clock and provides a three-eighths-inch opening all the way around. Screws passed through holes drilled in the supports will serve to hold the face in place at the top and bottom. The hands can be fixed in any desired position with a nut and bolt. Finally, two holes, one for the tuning condenser shaft and the other for the combination volume control and switch shaft, will complete the job.

If the clock case is ornately carved along the bottom edge, it may be necessary to cut away some of the decoration to take the volume-control and tuning-condenser knobs.

The circuit—a four-tube, tuned-radio-frequency hook-up—is mounted on a four by six-inch aluminum chassis. The tubes, coils, speaker, and a few fixed condensers are mounted on top of the chassis, the remaining parts below. To provide sufficient space for the tuning condenser, it will be necessary to cut a rectangular hole in the upper face of the chassis.

Three metal tubes and one glass tube are used. The glass tube (25Z5) serves as the rectifier for the combination A.C.-D.C. power supply. For simplicity, the rectifier circuit was kept to a minimum of parts. As shown in the diagram, it consists simply of a rectifier tube, a resistance (R_8), and a dual electrolytic condenser (C_9 and C_{10}). As in all A.C.-D.C. circuits, the power cord is provided with a built-in resistor (160 ohms) to cut down the 110-volt line voltage to the value required by the series-connected filaments of the four tubes.

In selecting the magnetic speaker for the set, choose one that has its magnets arranged in such a way that the radio-frequency coil can be mounted directly behind the speaker. This will save space. For the average cuckoo-clock case, the speaker cone should not measure more than five inches in diameter.

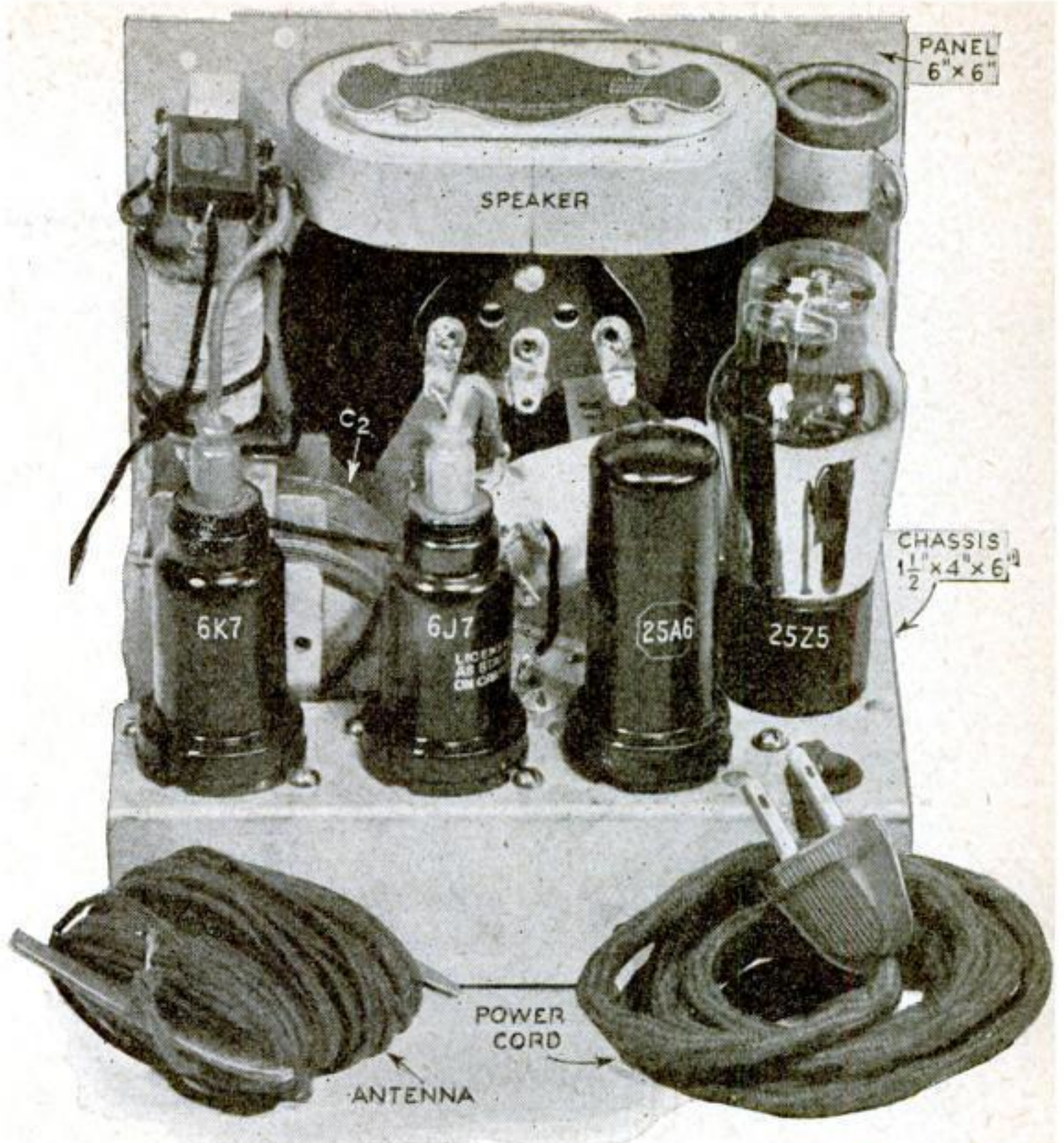
To obtain maximum sensitivity and make it possible to use a long outside antenna, the coils (L_1 and L_2), should be of the type having high-impedance primary windings. Suitable units can be obtained from any large dealer in radio parts. An outside ground should not be used, since the circuit is partially grounded through the power-cord connections to the electric wiring system.

No difficulty should be encountered in tuning the set. It operates smoothly and tunes sharply. Turn the tuning control slowly and ad-

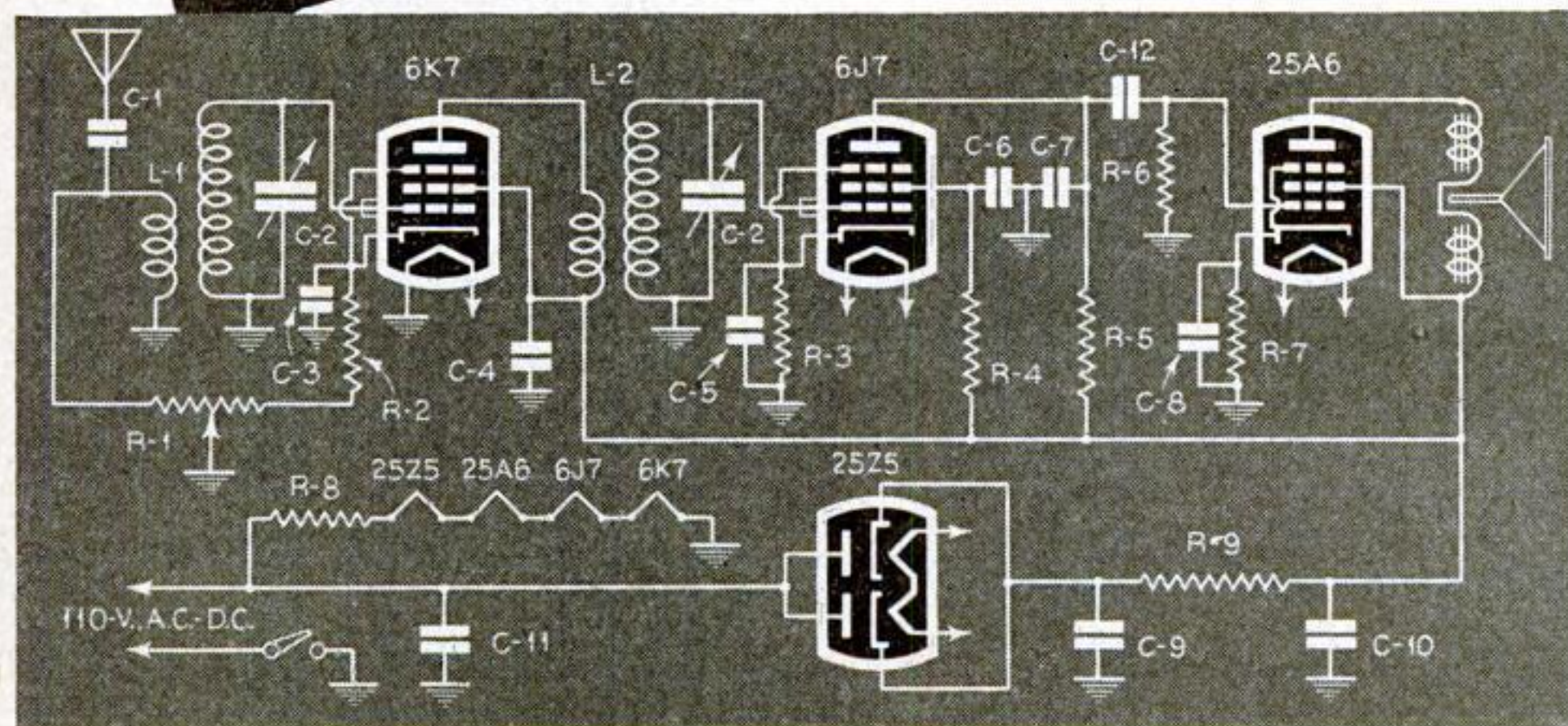
just the volume control to give maximum volume with best tone. Too much volume may overload the small speaker causing rattles and undertones.

In building the set, the reader may be tempted to substitute a dynamic speaker for the magnetic unit specified. This is not recommended, however. Most dynamic speakers require a relatively large amount of current for satisfactory operation and, since the total voltage available in the A.C.-D.C. circuit averages only ninety-five volts, the additional drain would lower the voltage available for the tubes. Any gain in volume obtained through the use of a dynamic unit, therefore, would be more than offset by the loss in amplification. The elimination of an output transformer also results in a saving in space.

How the various parts are placed. To provide a speaker opening, the face must be mounted as shown below



For ready reference, the items in the diagram below are labeled to correspond with the list of parts



LIST OF PARTS

- C_1 .—Fixed condenser, .01 mfd.
- C_2 .—Variable condenser, two-gang, .000365 mfd.
- C_3 , C_4 , C_5 , and C_6 .—Fixed condensers, tubular, .1 mfd.
- C_7 .—Fixed condenser, mica, .00025 mfd.
- C_8 .—Electrolytic condenser, 50 volts, 10 mfd.
- C_9 and C_{10} .—Dual electrolytic condenser, 16 mfd.
- C_{11} .—Fixed condenser, tubular, .02 mfd.
- C_{12} .—Fixed condenser, .03 mfd.
- R_1 .—Volume control, with switch, 25,000 ohms.
- R_2 .—Resistor, 300 ohms, $\frac{1}{2}$ watt.
- R_3 .—Resistor, 50,000 ohms, $\frac{1}{2}$ watt.
- R_4 .—Resistor, 2 megohms, $\frac{1}{2}$ watt.
- R_5 .—Resistor, 200,000 ohms, $\frac{1}{2}$ watt.
- R_6 .—Resistor, 500,000 ohms, $\frac{1}{2}$ watt.
- R_7 .—Resistor, 400 ohms, 1 watt.
- R_8 .—Resistor, in power cord, 160 ohms.
- R_9 .—Resistor, 5,000 ohms, 2 watt.
- L_1 and L_2 .—Coils, high-impedance primaries.
- Miscellaneous—Speaker, chassis, knobs, dials, tubes, wire, lugs, etc.

MAKING STEEL FLOAT..

..And Other Easy Chemical Stunts

ENTERTAINMENT, and useful little odds and ends of chemical lore, reward the owner of a home laboratory for performing any number of simple ABC experiments requiring a minimum of preparation. Among other things, you can make steel float, find out what "gold" printing really is made of, and perform magic writing without ink, using a nail attached to an electric battery for a pen.

Of course, steel will float in water if you shape it like a boat, and will bob to the surface of liquid mercury, no matter what its form. Possibly if a number of little balloons of hydrogen gas were attached to steel, it would float in other liquids. This is the means you can employ to make a piece of steel wool alternately dive and rise to the surface in a vessel of weak acid.

Make up the acid solution by slowly pouring a fluid ounce or so of strong sulphuric acid into about a pint of water, stirring the mixture meanwhile. When the liquid is cool, place it in a tall glass container such as a flower vase, a conical beverage glass, or a large graduated cylinder for measuring chemicals. Roll a piece of steel wool into a ball about the size of a marble, and drop it into the acid. It will immediately sink. Soon, however, the acid acts upon it and covers it with bubbles of hydrogen gas. If the piece of steel is not too heavy, it will be buoyed up and carried to the surface. Here the bubbles are dislodged, and the steel wool dives again to the bottom, to repeat the whole process. A little experimenting will show you the right quantity of steel wool to use; if the bubbles do not buoy it up, it is too heavy, and you must remove a little, while more steel wool must be added if the ball is too light and refuses to sink.

If you have a thin sheet of platinum foil about half an inch square, drop a piece of zinc in the glass vessel of acid, and then add the square of platinum metal. Upon sinking and making contact with the zinc, it will form a miniature electric battery, and hydrogen gas will be generated, causing the platinum to rise and fall alternately like the steel wool. Such a piece of platinum foil will cost considerably less than a dollar, and can be used repeatedly in many experiments.

"Vortex rings," like smoke rings in air, are easy to produce if you fill the same glass vessel with water containing some phenolphthalein solution and a bit of lye or household ammonia. As you recall, phenolphthalein leaves an acid solution colorless but turns an alkaline solution red, so the resulting solution will be red in color. Now, from a height of an inch or so above the liquid, let strong sulphuric acid fall into it, a drop at a time. As the dense acid strikes the colored solution, it forms a water-white ring that slowly settles to the bottom of the vessel. The ring is colorless, because the acid neutralizes the alkali, decolorizing any part of the solution with which it comes in contact.

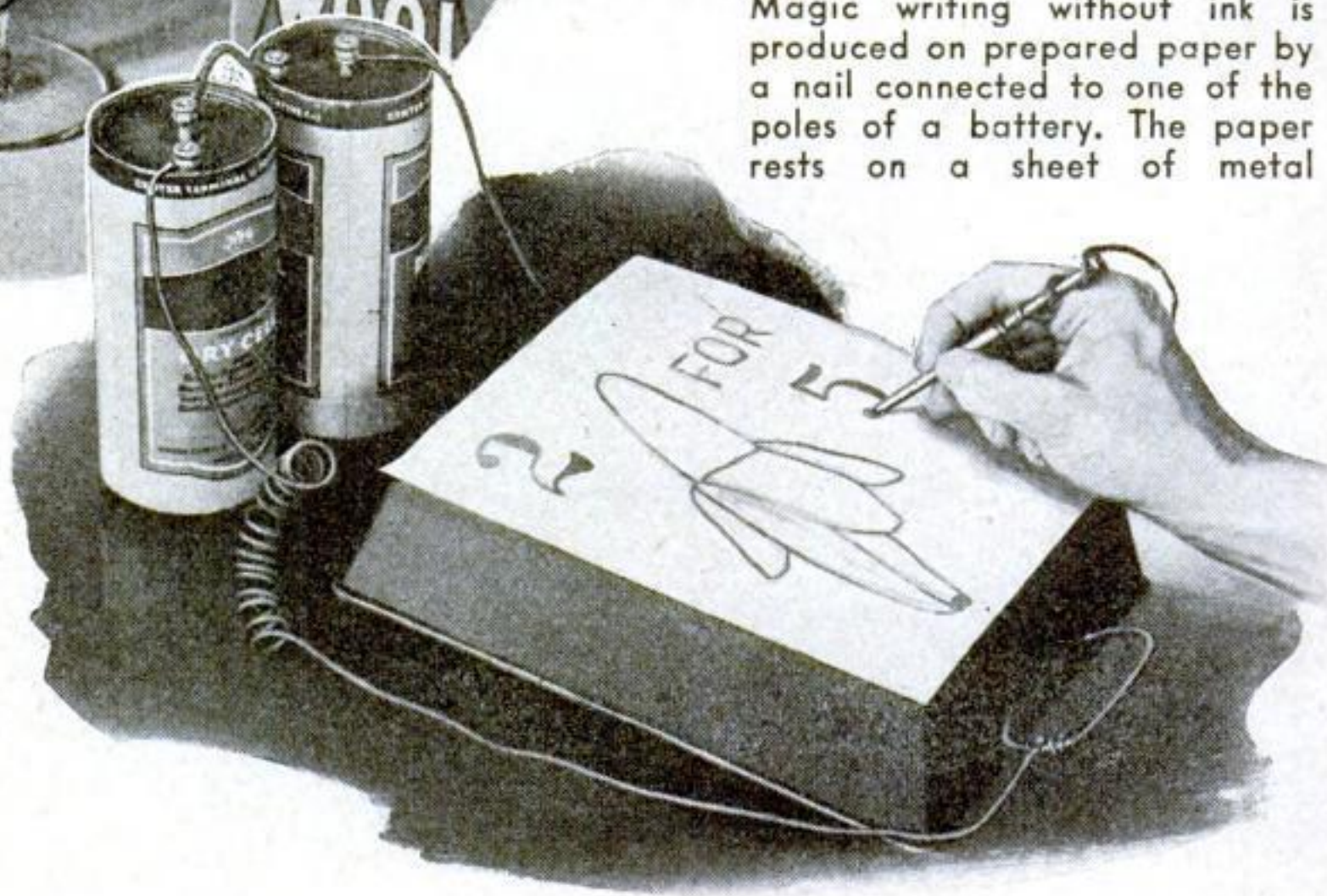
You can vary this pretty little experiment in a number



"Vortex rings," like smoke rings in air, are produced when acid is dropped into water containing phenolphthalein solution and lye

The ball of steel wool, at the left, alternately dives and rises as gas bubbles form on it and then are dislodged

Magic writing without ink is produced on prepared paper by a nail connected to one of the poles of a battery. The paper rests on a sheet of metal

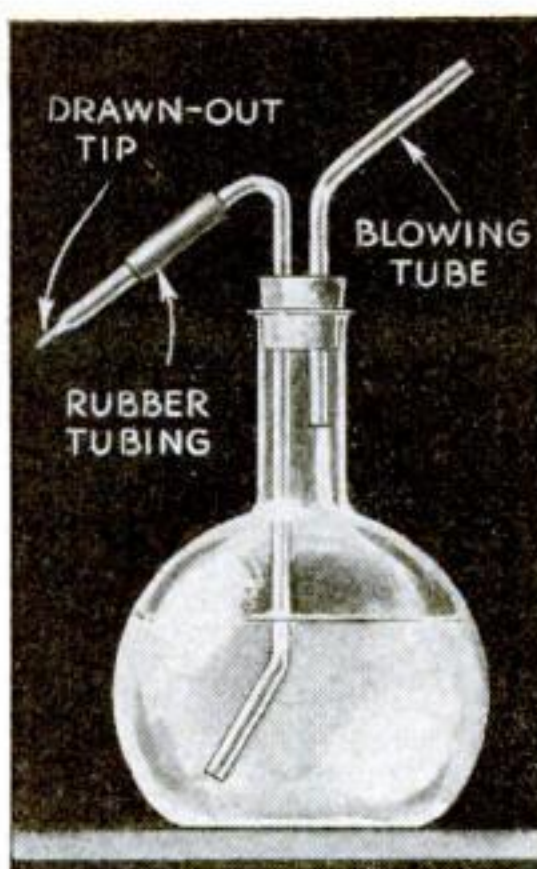


of ways. If the vessel contains only a colorless solution of water and phenolphthalein, red vortex rings are produced when drops of strong lye solution fall into it. Again, if the upper two inches of the liquid in the vessel consist of household ammonia and the lower part of plain water, with a little phenolphthalein solution in each, a drop of sulphuric acid falling from a height of several inches first produces a colorless ring. As it descends to the lower part of the vessel, however, the ring may become tinged with red, due to a surface film of alkali carried along by the ring of acid. Strong solutions of dyes, too, produce vortex rings when dropped in plain water, although here no chemical reaction is involved.

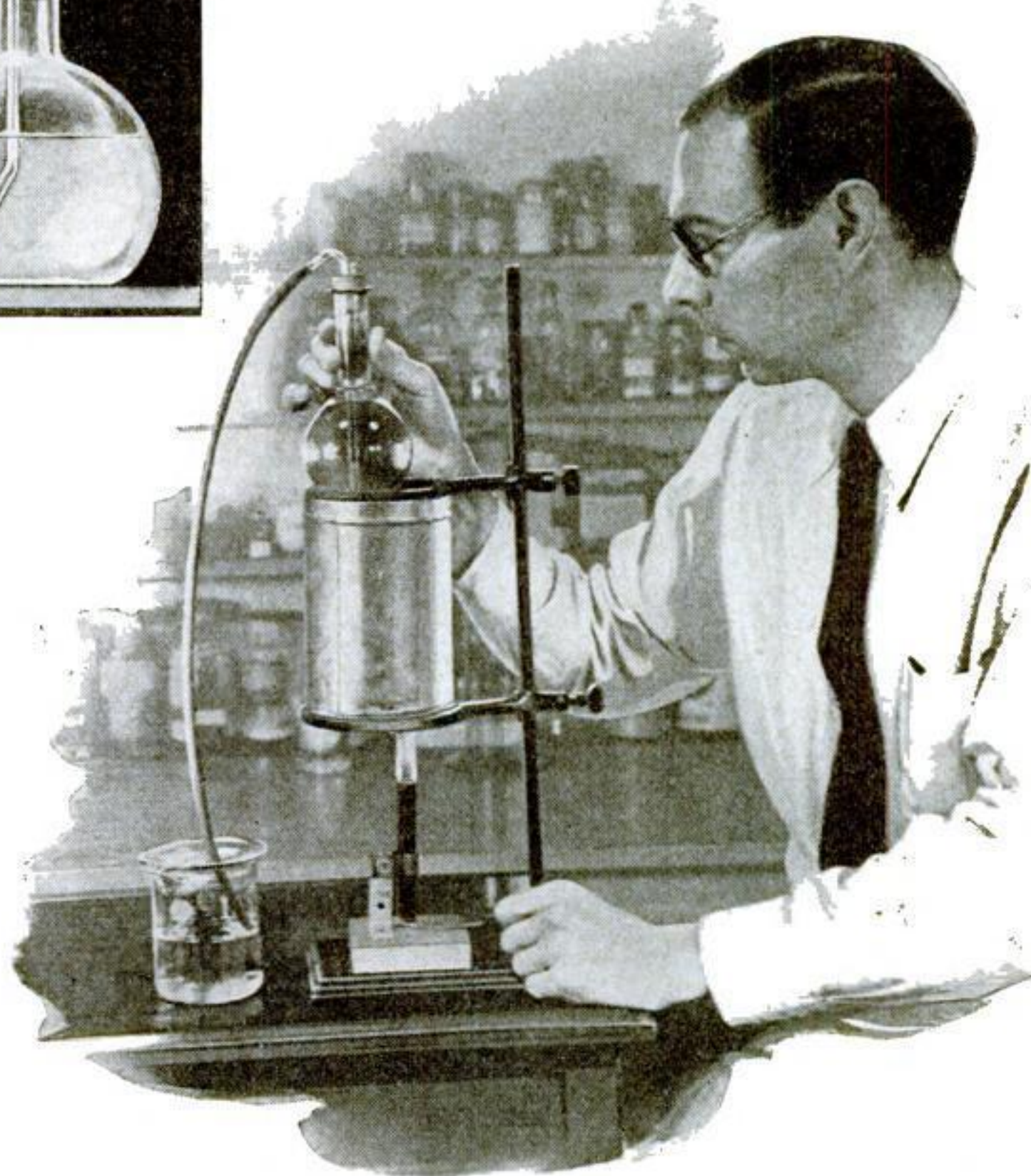
Probably you have experimented with chlorine gas before, and are familiar with its choking, biting odor and its great chemical activity. Asphyxiating to breathe, it bleaches the colors of moistened fabrics, and corrodes and tarnishes even noble metals like gold and platinum. You can safely make tests with chlorine, using one of the simplest of the many ways of generating the gas, which consists merely of heating crystals of cupric chloride (copper chloride).

A good preliminary step is to drive off the moisture, or "water of crystallization," in the cupric chloride crystals by heating them with a low flame in a beaker or evaporating dish until they are fairly dry. Then place some of the dried or dehydrated residue in a test tube, where additional heating produces the chlorine gas. Only a little dehydrated cupric chloride is needed, for one gram of it will yield about 100 cubic centimeters of chlorine. The unused residue from the preliminary heating may be kept for future use in a tightly corked bottle.

Lead the chlorine gas through a stoppered flask, in which the substance to be tested is placed, and then into a wide-mouth bottle containing a wad of cloth moistened with weak lye water or sprinkled with limewater and slaked lime. The last vessel acts as a trap to catch and destroy the chlorine so that it will not escape into the air. (Continued on page 142)

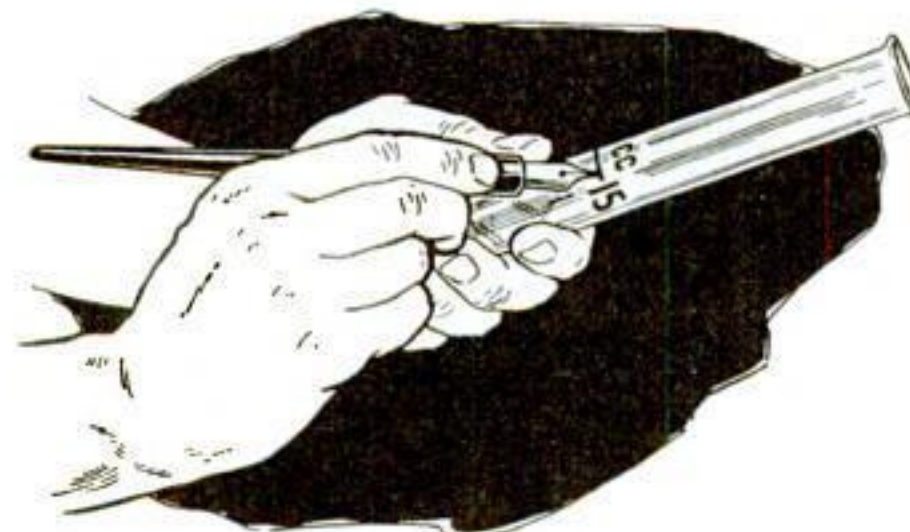
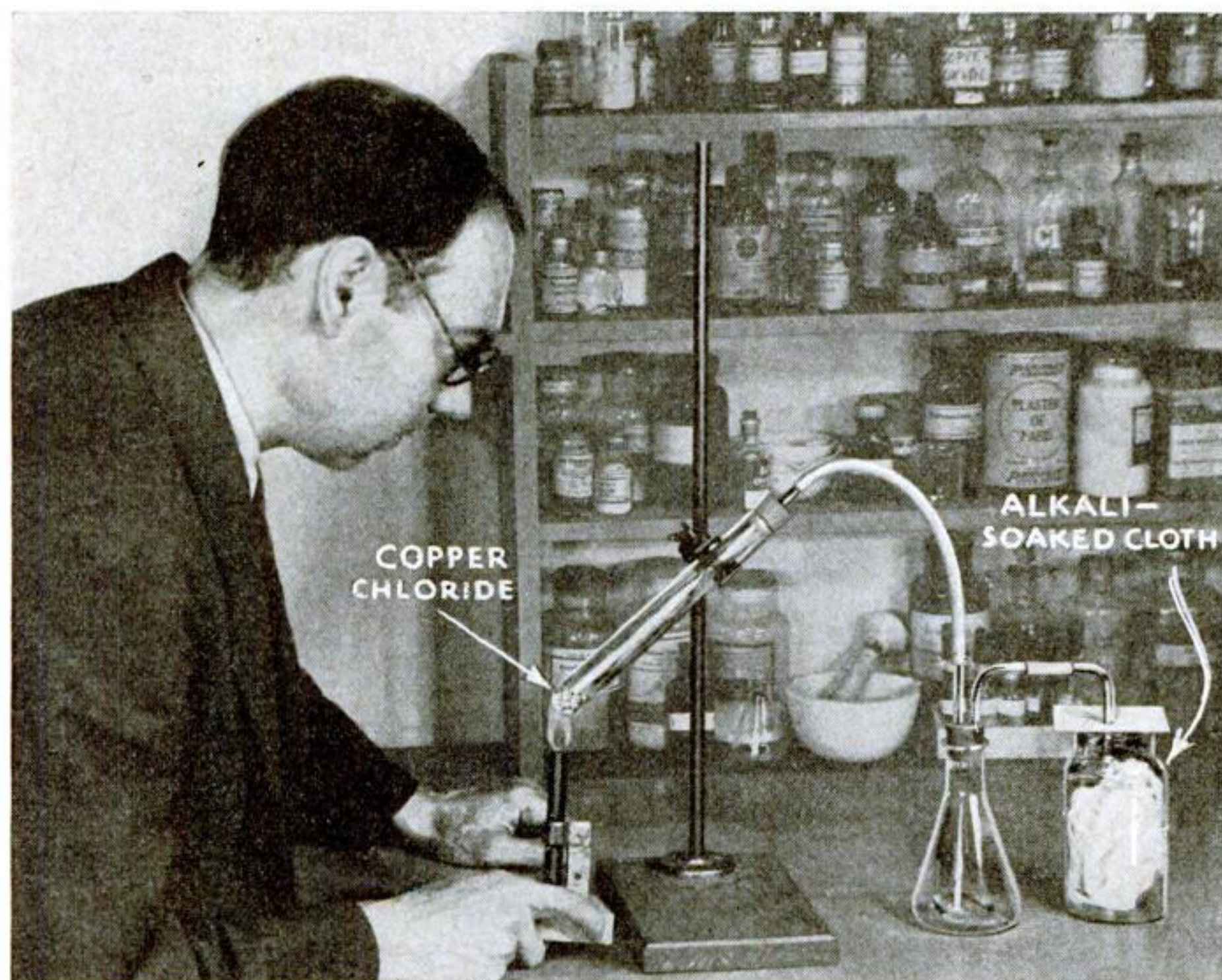


MEASURING AIR IN WATER. With the apparatus shown below, you can determine how much dissolved air your household water contains. An important part of the set-up is the wash bottle shown in the drawing



Here Is a Group of ABC Experiments That Do Not Require Any Special Equipment or Elaborate Preparation, and Yet Furnish Their Full Share of Entertainment and Information

By RAYMOND B. WAILES



HOMEMADE MARKING INK FOR WRITING ON GLASS

FOR writing permanently on chemical apparatus not made of heavy cast glass, you can make a good green marking ink by mixing equal parts of green chromic oxide with powdered lead borate. The chromic oxide is prepared by heating ammonium bichromate; the lead borate, by mixing a solution of borax with a solution of lead acetate or lead nitrate, pouring off the liquid, and washing the precipitate of lead borate. Stir the powders into a mixture of equal parts of water, alcohol, and glycerin, and apply the ink to the glass. When the writing is dry, warm the glass in a yellow Bunsen-burner flame, then heat it red-hot in a blue flame. Finally let it cool off in a yellow flame.

Strips of paper containing "gold" printing are being given a test with chlorine in the flask seen at the left. The gas is generated by heating cupric chloride crystals

WHAT TO DO WITH Broken Mirrors

By KENNETH MURRAY



Cutting the mirror into useful shapes and sizes

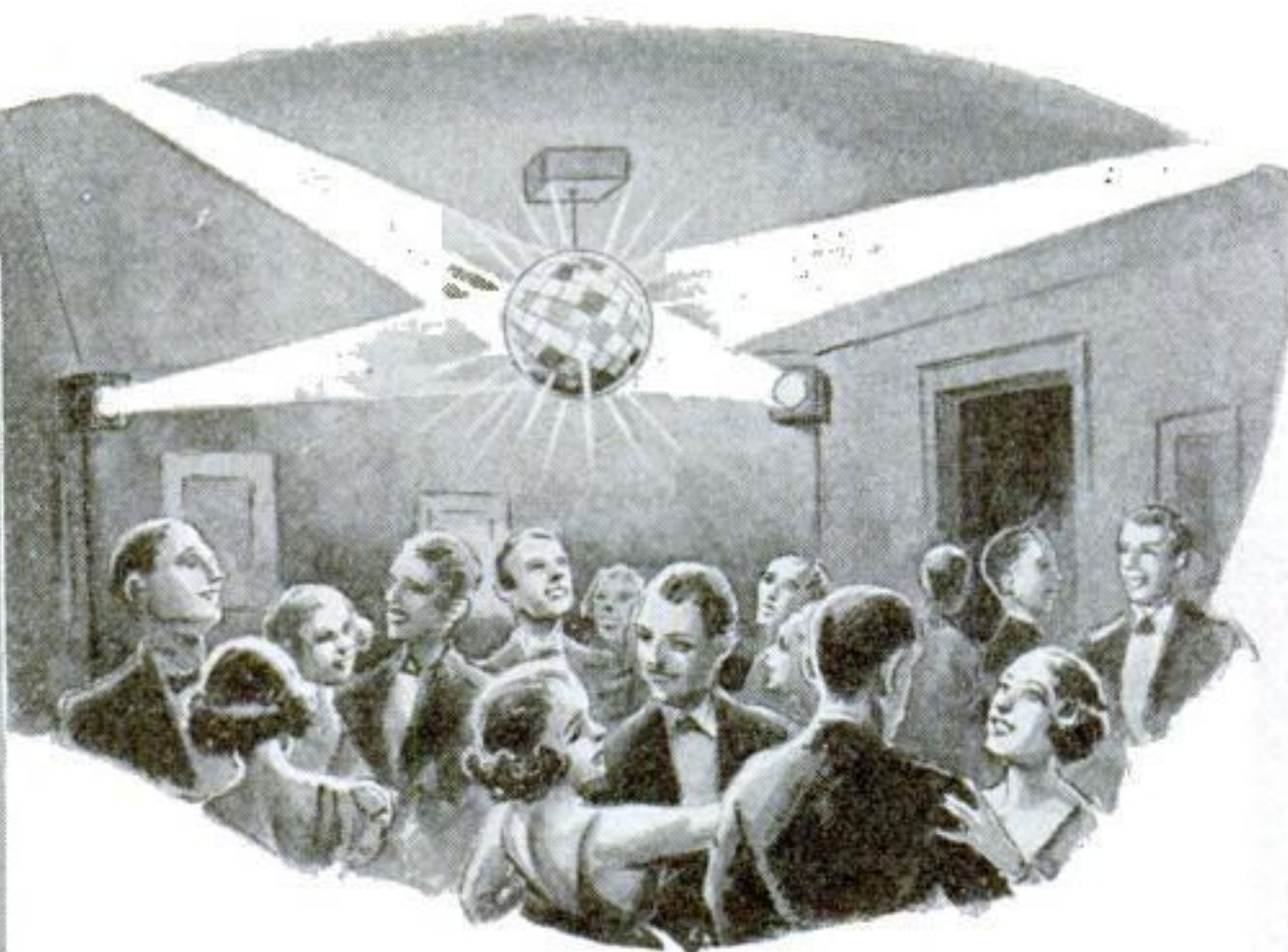
BREAKING a mirror need not necessarily signify seven years of bad luck, for it will at least provide you with materials for numerous projects that are easily made from the silvered glass.

To prepare house numbers or name plates, merely scrape the silver from the back of a piece of mirror to form letters or numerals; then coat the back with asphalt varnish and mount it in a sheet-metal bracket. Other suggestions are shown in the illustrations.

In cutting up the mirrors, use an ordinary ten-cent glass cutter and

keep it well oiled so it will work smoothly. Never go over the cut a second time as any repetition will dull the cutting wheel. Light, even pressure gives best results.

When the mirror glass is made into an article that will receive considerable handling in normal use, it is desirable to avoid very sharp edges or corners. These can be removed by rubbing with a fine sharpening stone, used with plenty of water. A makeshift method is to cover the edges and corners with thick lacquer (or cellulose cement), which will provide a smooth protection.



SPECTACULAR COLOR EFFECTS for parties and dances can be created by focusing colored spotlights on a mirror-covered globe. To make it, cement small squares of mirror over the outside of a large ball or toy globe and attach it to a spindle so that it may be spun by hand or by using a small, geared-down motor

PHOTOGRAPH FRAMES. Scrape the silver from the back of the mirror. Mount the picture and glass in a metal holder or use in a wood frame



VANITY MIRROR FOR AUTO. With an arrangement as shown below, you will no longer be bothered in finding the rear-view mirror at an angle when you need it most. A piece 4 in. high and 5 in. long will be about right



MIRROR CENTERPIECES cut in a variety of shapes form attractive bases for flower vases, or can be used as coasters. Always glue felt on the underside



THE MYSTERIOUS JAR OF CANDY. To do this trick, cut a mirror to act as a partition in a glass jar. Because of the reflection the jar appears empty. Fill the rear with candy ahead of time. Show "empty" jar to the audience, cover it with a handkerchief, then remove the latter and the mirror. Presto! The jar is partially filled with candy

"Do smokers appreciate the Costlier Tobaccos in Camels?"

A QUESTION ASKED BY MANY PEOPLE —



THE BEST ANSWER IS...

Camels are the Largest-Selling cigarette in America!

HELEN HICKS (right): "I smoke Camels constantly without a sign of 'jittery nerves.' I know Gene Sarazen, Lawson Little, and a lot of other topnotch golfers smoke Camels too. Camels are the last word in mildness."



Camels have given more people more pleasure than any other cigarette!

AND this didn't happen by chance. Camels are the largest-selling cigarette in America because people *can* and *do* appreciate finer, costlier tobaccos.

Millions have given Camels the severest test—they have smoked them steadily. And have learned to trust those finer tobaccos to give them more of the pleasure they want in smoking. If you are not a Camel smoker, try them. See if you, too, don't agree with those who find more enjoyment in *Camel's costlier tobaccos*.

JOSELYN LIBBY (right): "I smoke Camels—nothing else! As a secretary, I have to be on my toes every minute. When I feel fatigued, I take time out for a Camel and get a quick 'lift.' 'I'd walk a mile for a Camel!'"



SIR HUBERT WILKINS (left): "Where I go, Camels go with me. Camels help make my monotonous explorer's diet taste good and digest more smoothly."

NEW CAMEL CARAVAN

2 great shows in a single hour's entertainment!

Includes "Jack Oakie College" and Benny Goodman's "Swing School"! 60 fast minutes of grand fun and music. Every Tuesday night at 9:30 pm E.S.T., 8:30 pm C.S.T., 7:30 pm M.S.T., 6:30 pm P.S.T., WABC-CBS.



SHIP'S ENGINEER, George Buckingham (left): "Ashore or afloat, you won't catch me without a good supply of Camels handy. No sir! I've been smoking 'em for years. I just never tire of that agreeable taste of Camels!"

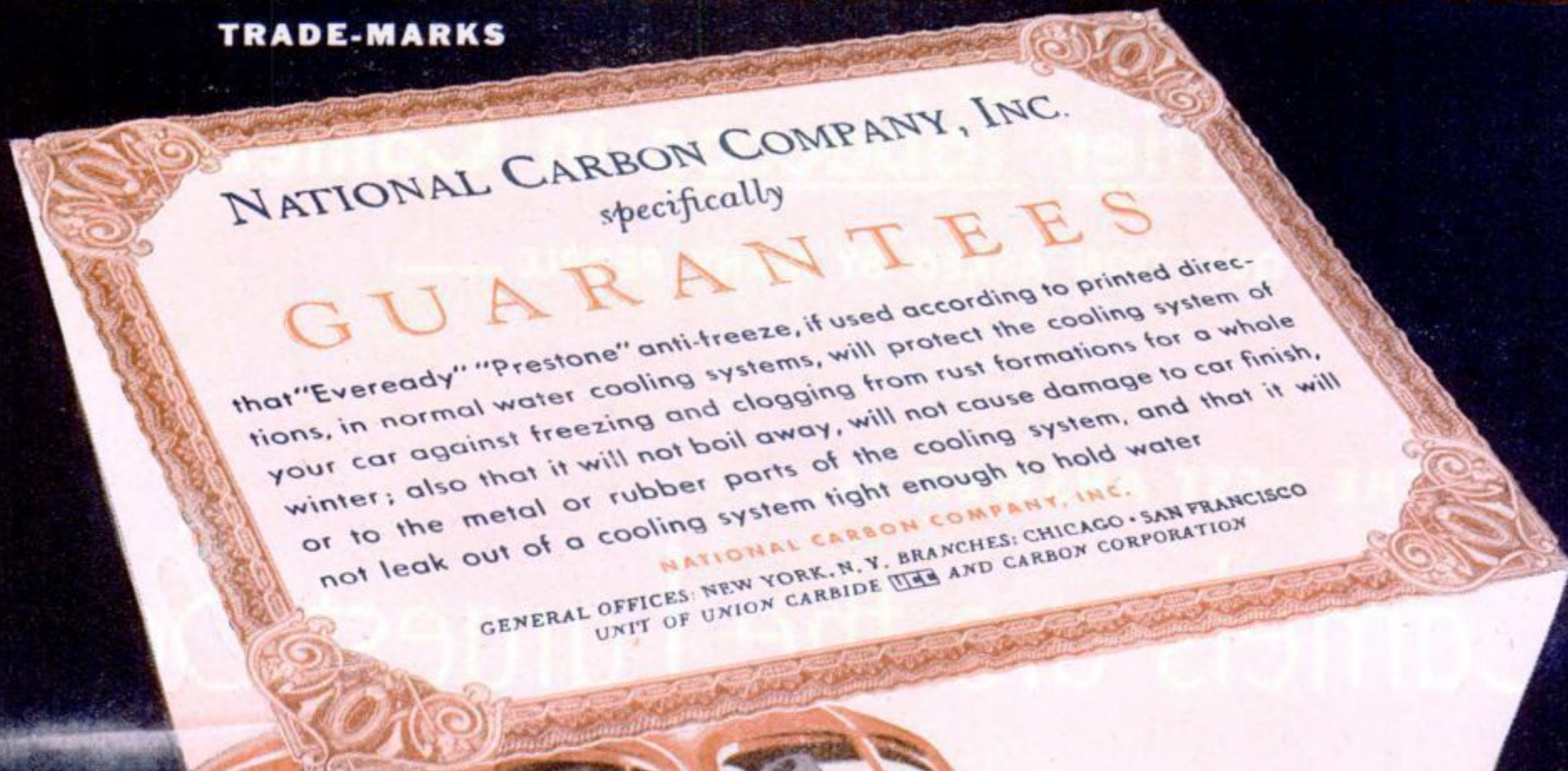


Camels are a matchless blend of finer, **MORE EXPENSIVE TOBACCOS** —Turkish and Domestic.

Copyright, 1937, R. J. Reynolds Tobacco Company, Winston-Salem, N. C.

DRIVE UNDER THIS GUARANTEE WITH EVEREADY PRESTONE ANTI-FREEZE

TRADE-MARKS



FIND YOUR CAR ON THIS CHART

IMPORTANT! The price per gallon of an anti-freeze means nothing unless you know *how many gallons* you will need during the *entire* winter. You can't get that information on a boil-away anti-freeze. But you *can* get it for "Prestone" anti-freeze...and here it is. See how reasonably you can get two-way protection *all winter long* against both freeze-up and rust with *one shot* of "Prestone" anti-freeze—one shot because it won't boil off, no matter how warm the weather gets

between the cold snaps. If your car isn't on this chart, your dealer has a chart showing all cars; and amounts needed for temperatures to 60° below zero.

Find your car and read from left to right. The first figure shows the protection you get with one gallon of "Eveready" "Prestone" anti-freeze in the cooling system; the second with one and a half gallons—and so on. "+" means above zero. "-" means below zero. If your car has a hot water heater, add ¼ gallon to the quantity called for.



\$2⁹⁵
A GALLON

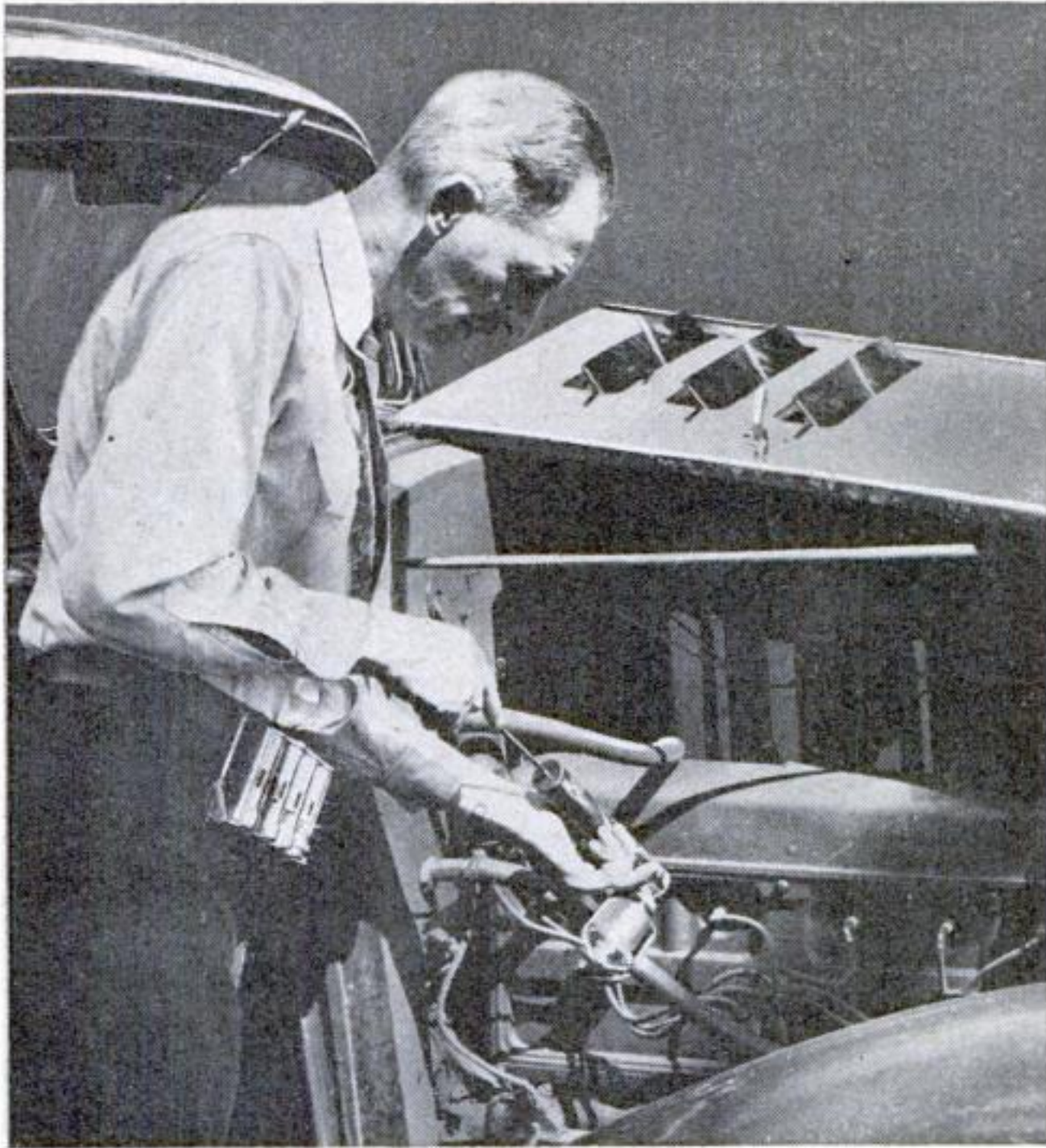
MODEL	1 GAL.	1-1/2 GAL.	2 GAL.	2-1/2 GAL.	MODEL	1 GAL.	1-1/2 GAL.	2 GAL.	2-1/2 GAL.	MODEL	1 GAL.	1-1/2 GAL.	2 GAL.	2-1/2 GAL.
Auburn					Graham					Packard				
6-52, '34; 6-53, '35; 6-54, '36	+12	-4	-27	-59	80, 90, 110, '36; 95, 116, 120, '37	+10	-8	-34	-62	120, '35, '36; 6, '37	+14	0	-21	-50
850, '34; 851, '35; 852, '36	+17	+6	-9	-28	73 Spl. 6, 72-8, '35	+14	0	-21	-50	8, '33 to '35; 1400-1-2, '36; 120, '37	+16	+4	-12	-34
Buick					74-6, '35; 85, '37	0	-34	-62		Super 8, '35, '36	+18	+8	-6	-23
40, '34, '35, '36, '37	+6	-18	-54		6, 8, '33; 6, 8, '34; 75, '35	+16	+4	-12	-34	1500-1-2, '37	+19	+10	0	-15
60, '32; 50, '33, '34, '35	+10	-8	-34	-62	Hudson					12, '33 to '37	+21	+16	+10	
60, 80, 90, '36, '37	+12	-4	-27	-59	6, '35 (early); 6, '36; 6, '37	+3	-25	-62		Pierce Arrow				
80, 90, '32; 60, '33, '34, '35	+15	+2	-16	-42	8, '36, '37	+16	+4	-12	-34	836, '33, '34; 1601, '36; 1701, '37	+20	+12	+1	-12
80, 90, '33; 90, '34, '35	+19	+9	-3	-19	8, '34, '35	+19	+9	-3	-19	840-A, '34; 845, '35	+22	+15	+6	-5
Cadillac					6, '35 (late)	+14	0	-21	-50	1602-03, '36; 1702-03, '37	+24	+20	+15	+9
85, '37	+12	-4	-27	-59	Hupmobile					1240-A, 1248-A, '34; 1245, 1255, '35	+21	+16	+10	
370-D, '34, '35	+14	0	-21	-50	417, 421, '34; 521 (J), '35	+10	-8	-34	-62	Plymouth				
355-D, '34, '35; 80, 85, '36	+16	+4	-12	-34	518 (D), '35; 6-618-G, '36; 6, '37	+16	+4	-12	-34	PC, PD, '33	+3	-25	-62	
452-D, '34, '35; 90, '36	+19	+9	-3	-19	422, '34; 8-621-N, '36	+18	+8	-6	-23	PF, PG, '34	+6	-18	-54	
60, 65, 70, 75, '37	+20	+12	+1	-12	426, '34; 527, '35; 627, '36; 8, '37	+19	+10	0	-15	PA, '31; PB, '32; PE, '34; PJ, '35	+8	-12	-43	
60, 70, 75, '36	+22	+15	+8	0	Lafayette					P1, P2, '36; P3, P4, '37	+8	-12	-43	
Chevrolet					6, '34, '35, '36	+15	+2	-16	-42	Pontiac				
Stand. '33, '34, '35	-12	-62			"400", '37	+16	+4	-12	-34	'30, '31; 6, '32, '35	+6	-18	-34	
Master, '33, '34, '35	-6	-47			La Salle					8, '33, '34, '35; 6, '36	+8	-12	-43	
All Models, '36	+8	-12	-43		35-50, '35; 50 (Str.'8), '36	+12	-4	-27	-59	6, '37	+10	-8	-34	-62
All Models, '37	+6	-18	-54		350, '34	+15	+2	-16	-42	8, '36	+12	-4	-27	-59
Chrysler					345-B, '32; 345-C, '33; 37-50, '37	+20	+12	+1	-12	8, '37	+15	+2	-16	-42
6, '32, '33, '34, '35; AF, '37	+12	-4	-27	-59	Lincoln					Reo				
AF-8, Imp.-8, '35; 6, '36	+15	+2	-16	-42	Zephyr, '36, '37	+22	+14	+4	-6	FC, '35, '36; Roy, '35	+15	+2	-16	-42
Roy-8, Imp.-8, '33; AS-8, '35;	+16	+4	-12	-34	V-12, '33 to '37	+23	+17	+10	+2	8-25, S, '32; S-2, '33; S-6, '34	+16	+4	-12	-34
Royal, '37	+18	+8	-6	-23	Nash					Roy, N-2, '33; Roy, (8), '34	+20	+12	+1	-12
DeL-8, '36; Imp., '37	+18	+8	-6	-23	1070, 1130, 1170, '33; 3720, '37	+12	-4	-27	-59	Studebaker				
De Soto					1220 (Big 6), '34; Adv. 6, 3540, '35	+14	0	-21	-50	Dic. 8, '32; 6, '33; Dic. 6, '36, '37	+6	-18	-54	
6, '34; AF, AS, '36; 6, '37	+16	+4	-12	-34	3620, 3640, '36; 3780, '37	+14	0	-21	-50	Com., '31 to '33; Dic., '34, '35;	+10	-8	-34	-62
AF, AS, '35	+12	-4	-27	-59	Adv. 8, '34, '35; Amb. 8, '36	+17	+6	-9	-28	Pres., '37	+14	0	-21	-50
Dodge					1090, 1190, '33; Amb. 8, '34	+18	+8	-6	-23	Pres., '33, '34, '36; Com. '34	+17	+6	-9	-28
6, '32, '33, '34; D-2, '36	+8	-12	-43		Oldsmobile					Pres., '30 to '32, '35; Com. '35				
Senior-6, '30; DU, '35; D-5, '37	+12	-4	-27	-59	F, '35, '36	+3	-25	-62		Terraplane				
Ford					F, '34; L, '35, '36; F, '37	+10	-8	-34	-62	6, '32, '33; 6 Spec. (early), 6 DeL.	+3	-25	-62	
V-8, '32 to '36; V-8-78, '37	+18	+8	-6	-23	L, '33; L, '34	+15	+2	-16	-42	(early), '35; 6, '36, '37	+10	-8	-34	-62
V-8-74, '37	+10	-8	-34	-62	L, '37	+16	+4	-12	-34	8, '33	+10	-8	-34	-62
										6, '34; 6 Spec. (late), 6 DeL.	+14	0	-21	-50
										(late), '35				
										Willys				
										77, '33 to '36	-21			
										37, '37	-6	-47		

When you get "Prestone" anti-freeze you get your car off your mind. Protection that can't be guaranteed, is no protection at all. When you can insure your car against BOIL-AWAY, FREEZE-UP and RUST for the whole winter, under the "Eveready" "Prestone" guarantee, why consider any other anti-freeze?

"Prestone" anti-freeze does not boil away; therefore, *first cost is last cost*...one shot protects your car until spring.

Timely Aids for Autoists

Oil Spray Aids In Drying Ignition Wires



When a car won't start due to moisture that has collected on the ignition wires leading to the spark plugs, get an inexpensive spray gun of the type used for insecticides and sold at most five-and-ten-cent stores for a dime. Then fill it with kerosene, pump the handle a few times, and spray the oil on the cables until they become coated with a thin film of the liquid. The moisture that is causing the short will tend to float on the surface of the oil where it can easily be wiped off with a dry cloth. I have used this method successfully a number of times to start automobiles when all the other methods I have heard of ended in complete failure.—K. M.

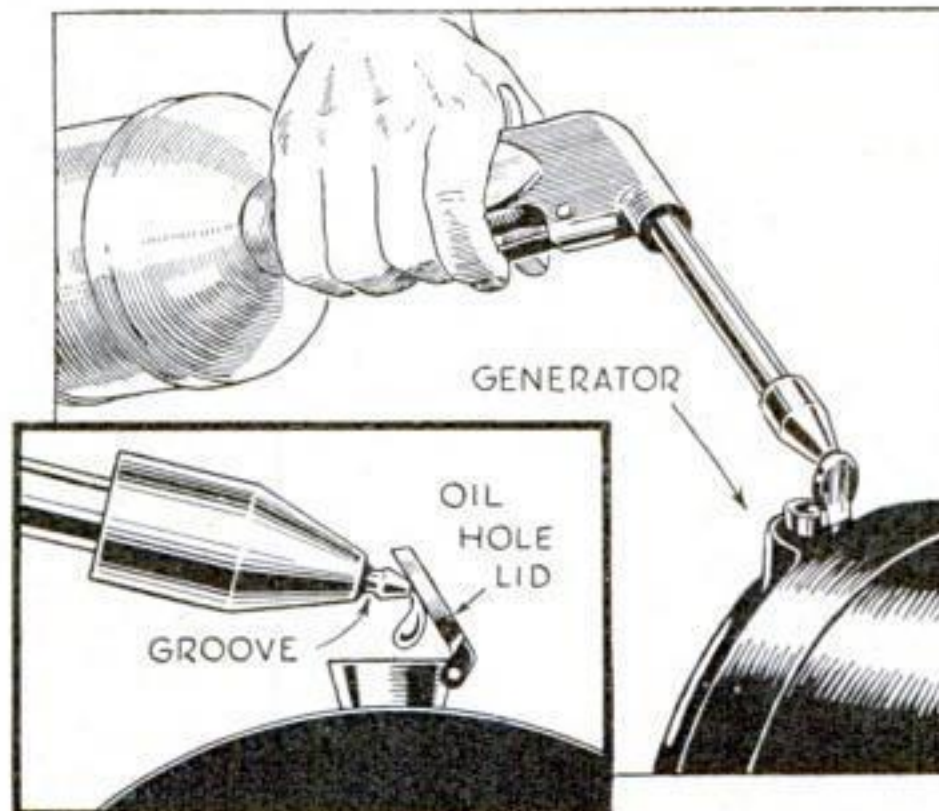


Handkerchief and Can Form Parts Holder

A CONVENIENT holder for small parts can be made by tying a handkerchief around a tin can. The center of the cloth bags down to form a safe receptacle for nuts, screws, bolts, and other small parts while a repair job is under way.—A. H. W.

Rubber Fender Mallet Made from Toy Ball

A SERVICEABLE rubber mallet for repairing damaged fenders can be made for about fifteen cents. Buy a sponge-rubber ball about three inches in diameter at your neighborhood toy store. Drill two sets of holes in a strip of scrap iron and bend this around the ball. Insert long bolts into the holes and through the end of a hardwood handle as indicated in the drawing below. When the clamp is tightened, the ball will puff out at both ends to form a sturdy mallet.—H. A.

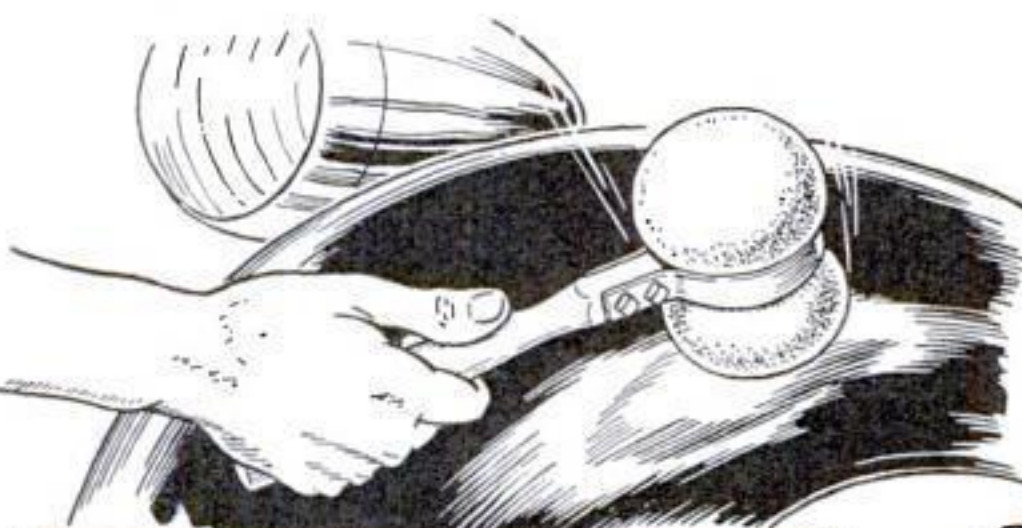
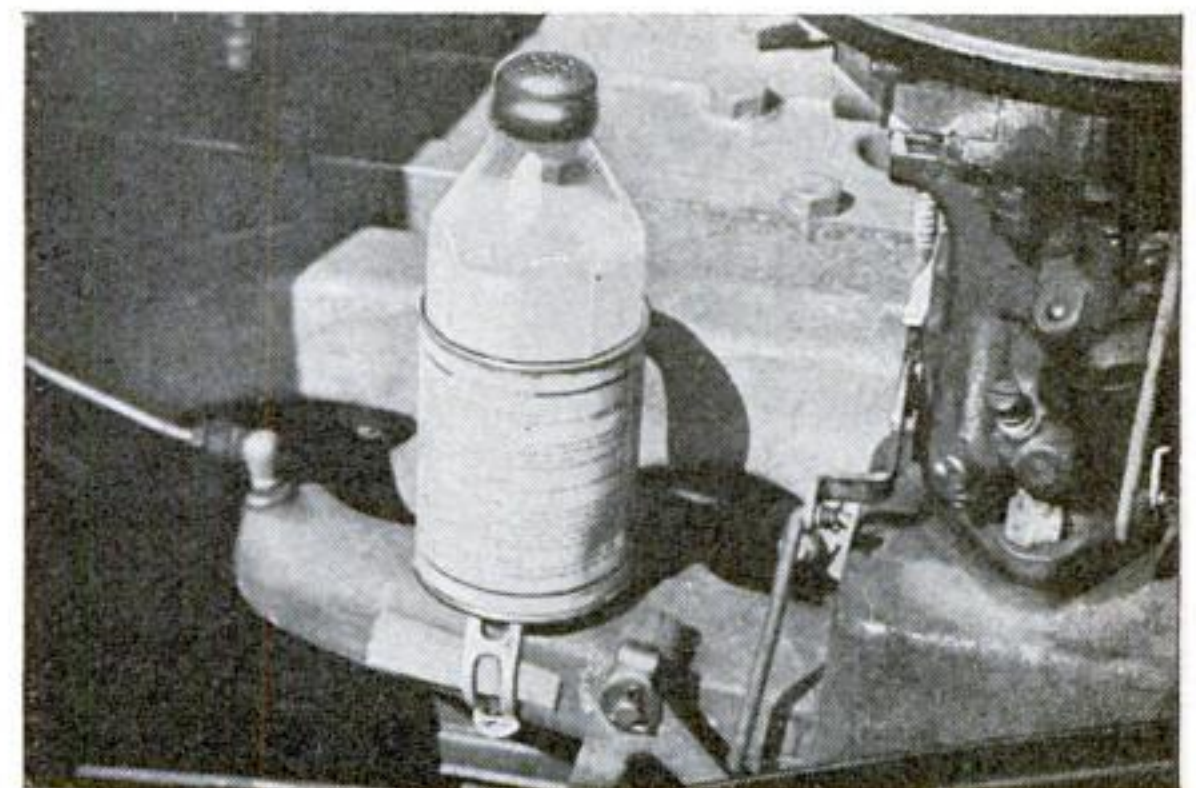


Tiny Groove on Spout Improves Oil Can

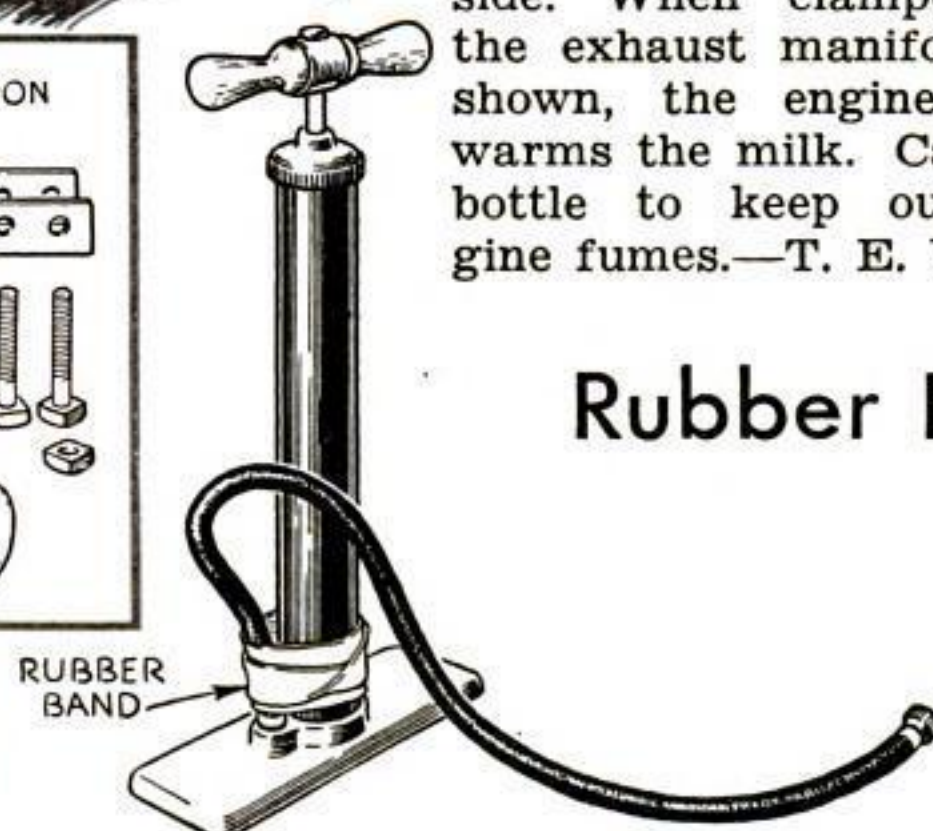
SOMETIMES it is both awkward and hazardous to reach around a car engine, lift the hinged cap of an oil cup with one hand, and squirt in oil from a can held in the other. To solve this difficulty, I filed a groove around the tip of the oilcan spout. Now the job can be done with one hand, as the groove catches the edge of the cup to swing it open.—A. M. C.

Handy Bottle Warmer Uses Engine's Heat

MOTORISTS who take their young infants along on automobile trips will appreciate an inexpensive bottle warmer for heating the baby's formula. Drill a hole in the bottom of a tin can that will just accommodate the nursing bottle, and make a wide opening in one side. When clamped on the exhaust manifold, as shown, the engine heat warms the milk. Cap the bottle to keep out engine fumes.—T. E. U.



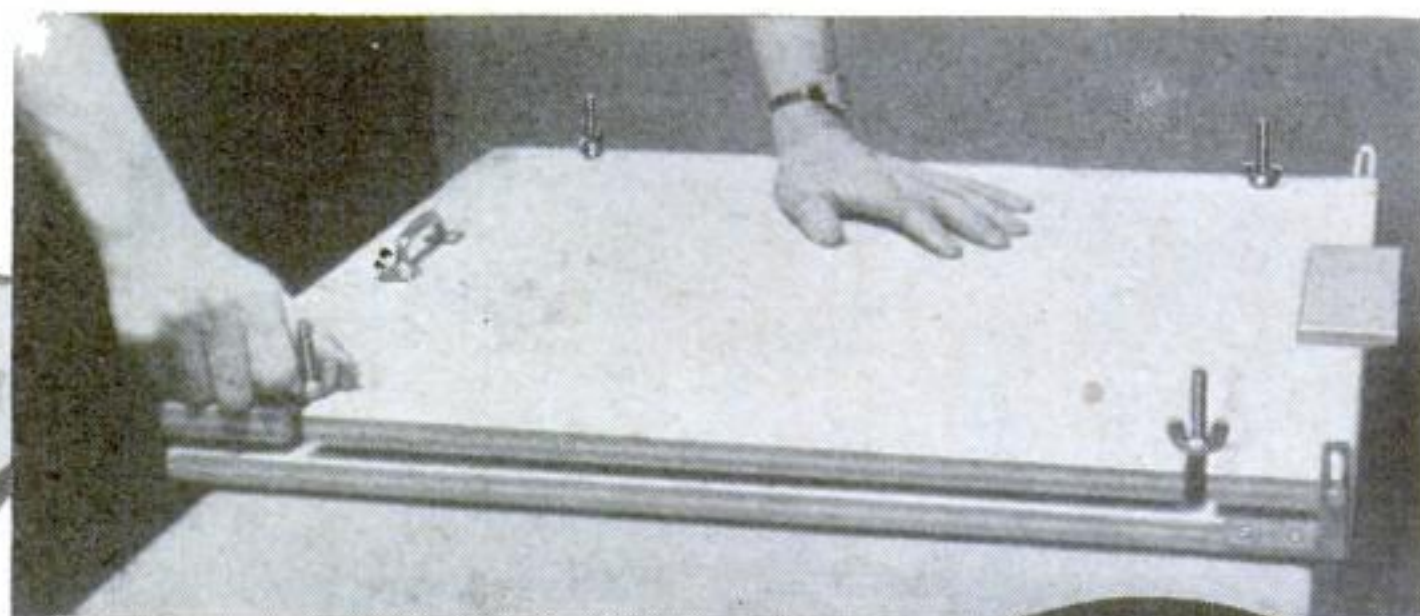
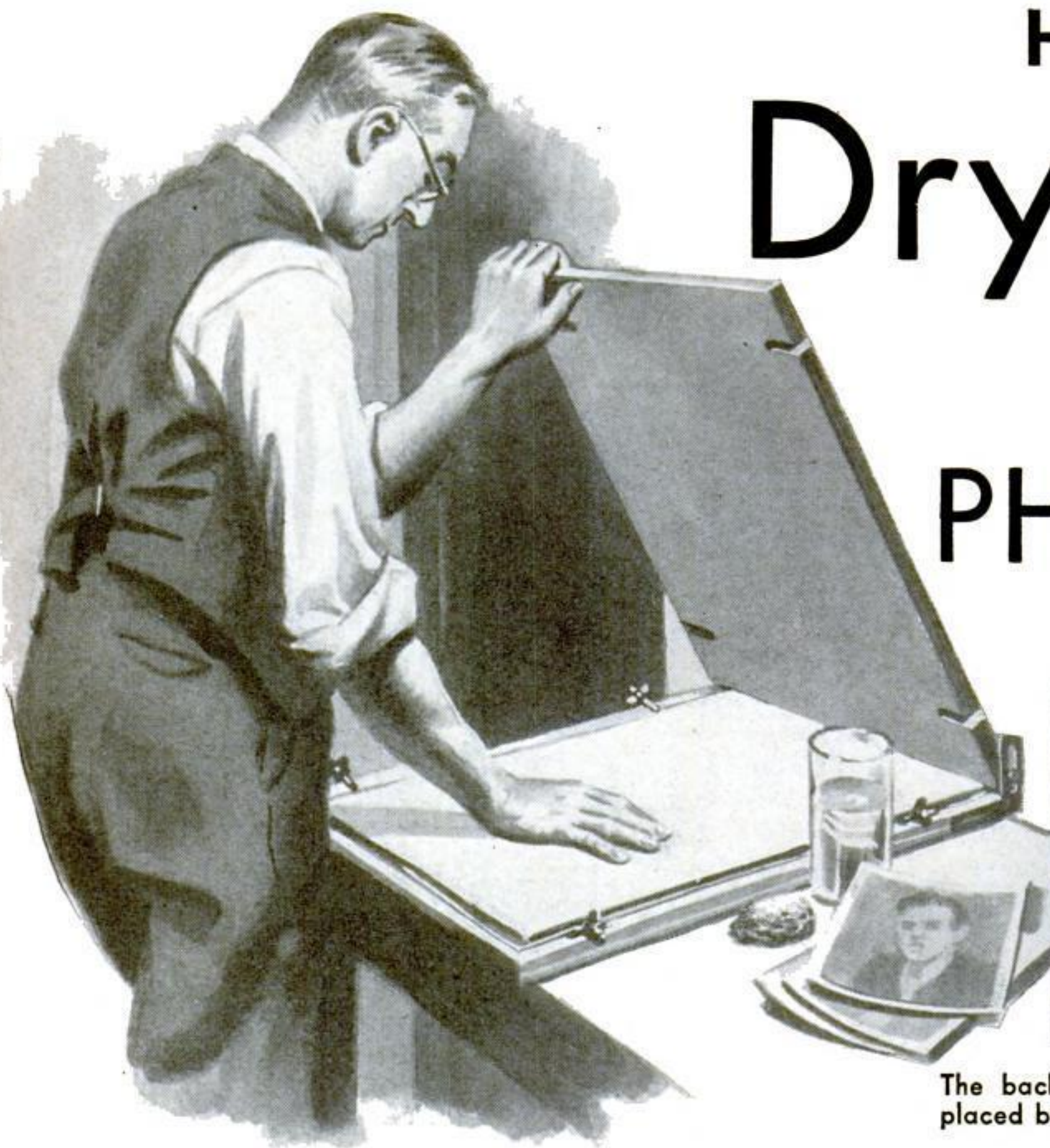
How the ball, clamp, and handle are assembled. A rubber band protects the pump hose at left



Rubber Band Protects Hose On Pump

CONSTANT kinking of the hose at the base of an automobile tire pump soon causes it to crack. To overcome this, I wrap a wide rubber band around the hose and pump barrel as pictured at the left. Although it allows the hose to move freely, it prevents damage caused by kinking.—W. A. H.

HOMEMADE Drying Press FLATTENS PHOTOGRAPHS



The backs of the prints are moistened, placed between blotters, and pressed flat

A DRYING press to flatten photographs is inexpensive and simple to construct. The cost of the one illustrated, including a dozen photographic blotters, was about two dollars.

Having plenty of room, I built my press to take full-size blotters (19 by 24 in.), but a smaller press may be made and the blotters cut to fit. One for half-size blotters (12 by 19 in.) is convenient and will take care of prints up to 11 by 14 in.

For a full-size press, have your local lumber dealer cut two pieces of $\frac{3}{4}$ -in. plywood, 22 by 27 in. Sandpaper the edges and corners, set one board on top of the other, and apply adjustable hinges made from brass angle braces as shown. These hinges are merely brass angle braces with one arm of each drilled and filed out to form a slot. A brass screw a little smaller than the slot is screwed into the top board and serves as the pivot. The purpose of this type of hinge is to compensate for the number of blotters used. At the other end of the cover board, a screen-door handle or any knob is fastened.

Four $\frac{3}{8}$ -in. holes are bored through each corner of both boards, 3 in. from the ends and 1 in. from the sides. On the top board, these holes are made into $\frac{3}{8}$ by 1-in. open slots by cutting in from the sides with a fine hack saw.

Obtain four 4 by $\frac{3}{8}$ -in. carriage bolts and wing nuts. Cut the bolts off about 1 in. from the head. File a $\frac{1}{8}$ -in. slot $\frac{1}{4}$ in. deep in the end of the long piece as shown, and round off the corners. The end of the short piece is then filed to fit into the slot, and the corners are rounded. The pieces are now joined, drilled, and fitted with a pin, which should be a tight fit in the two outside holes. The hole in the middle should be

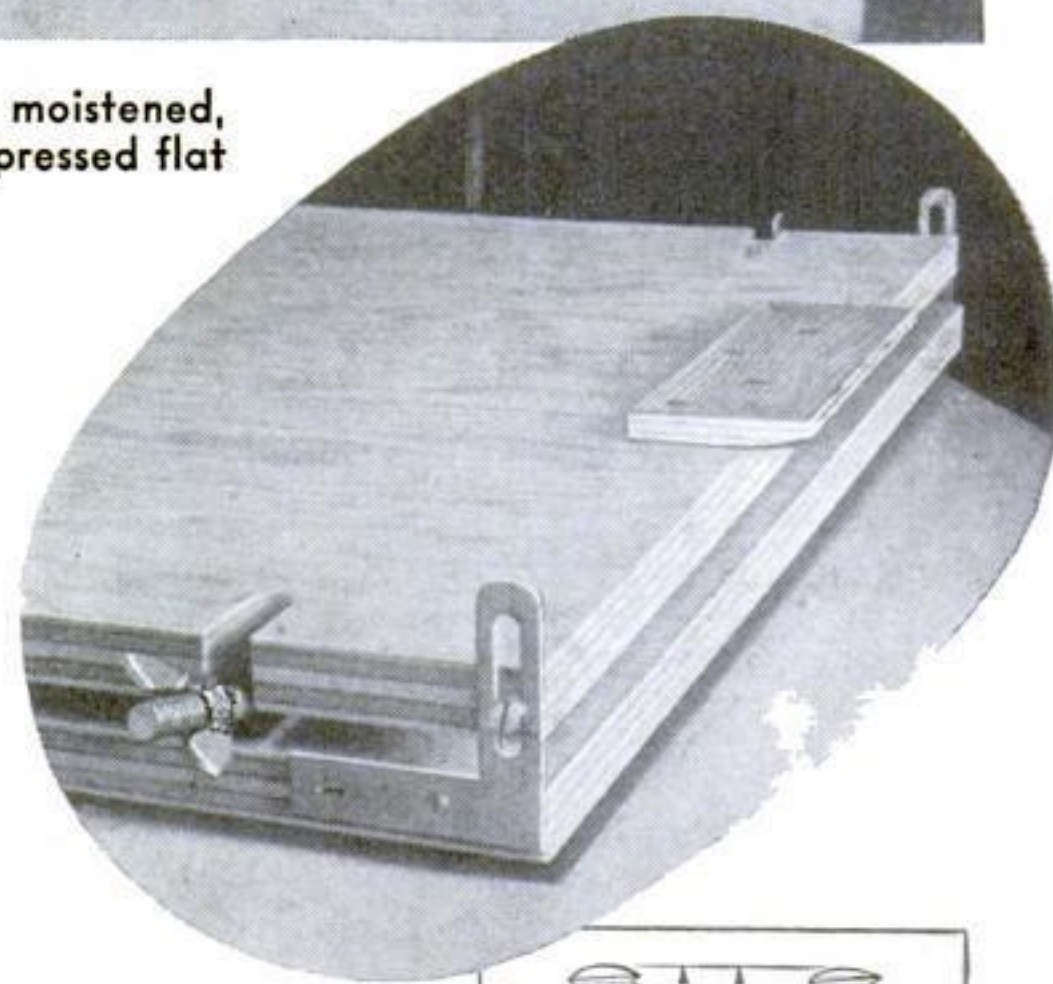
slightly enlarged, so that the two pieces of the bolt are loosely hinged together. The bolts are pushed up through the holes in the bottom board and adjusted so that they can be swung out of the slots in the cover board.

The square underhead of each bolt is then hammered into the bottom board to prevent the bolt from turning when the wing nuts are tightened.

A piece of $\frac{3}{8}$ by 3 by 6 in. plywood is screwed on the back of the cover board, projecting about 1 in. over the back, to prevent the cover from falling backward when raised. A few coats of shellac, and the press is complete.

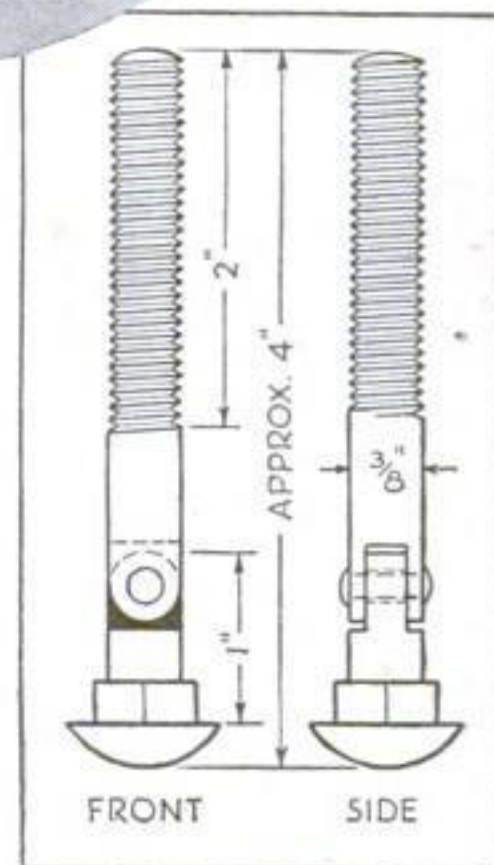
Prints to be dried are placed between blotters in the press, but no pressure is applied. When they are dry, dampen the backs with either water or a fifty-fifty solution of water and alcohol; then place them between blotters and tighten the wing nuts. Be sure to apply even pressure on all four corners. Leave the prints in the press for at least twenty-four hours.

Ferrotypes plates with the prints on may also be dried in the press. Another use is for mounting large prints. Use a good grade of photo paste and leave the mounted print under pressure until the paste is bone dry.—FRANK MCCARTY.



Back of the press showing the self-adjusting hinges, one of the quick-acting clamp bolts, and the block to prevent the cover from falling back

The bolts are carriage bolts altered as shown at right



Typewriter Removes Curl from Photo Prints

WHEN a number of photographic prints have been finished and are found to be badly curled after drying, they may be ironed out in a few minutes by rolling each of them several times, in reverse position, through the platen of a typewriter as shown at the left. The prints need not be moistened to make them respond to this treatment.—G. E.

America's fastest growing hobby

SNAPSHOTS at NIGHT



Just do this

1. Load your camera with Kodak "SS" Film



2. Use two or three Photo-flood lamps in Kodak Handy Reflectors



FREE BOOKLET...

Suggests a variety of picture opportunities . . . shows you how to arrange your lights . . . how to place your subject . . . tells you everything you need to know about two ways to make night pictures—snapshots with Photoflood lamps, fast exposures with Photoflash lamps. (You can use Photoflash lamps, each good for one picture, if your particular camera can be set for "time.") The directions are simple and easy to understand. Get a free copy at your dealer's today . . . Eastman Kodak Company, Rochester, N. Y.



THERE'S fun for the whole family in snapshots at night. Baby in his bath . . . the youngsters with their pets . . . grown-ups harmonizing at the piano . . . everybody enjoys the "shooting." And you, most of all—for you're snapping those intimate family pictures that you've always wanted, never hoped to get.

You don't need an expensive

camera for snapshots indoors at night—not any more. Any camera that can be loaded with Kodak "SS" Film will do the trick—even the simplest Brownie.

With "SS" Film, you use two or three of the new No. 2 Mazda Photoflood lamps, which last for hours, in the inexpensive Kodak Handy Reflectors. If your camera has an $f.6.3$ or faster lens, then No. 1 Photoflood lamps are powerful enough.

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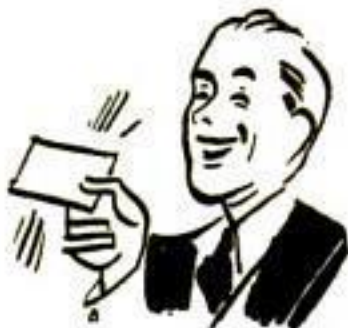


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Please tell me how I can own—for only a few cents a day—a latest model, factory-new Royal Portable—complete with *free* Carrying Case and Instant Typing Chart.

Name _____

Street _____

City _____ State _____

I already own a _____ Typewriter,
Serial No. _____. Tell me how much you
will allow on it as CASH payment on a new Royal Portable.

Take-Down Platform

(Continued from page 99)

top to act as a guard rail. Holes for $\frac{1}{4}$ -in. bolts are bored through apron and framework as shown.

The wiring diagram provides for two transformers to operate two trains on separate tracks. A feeder supplies current directly to the switches, and a parallel circuit is provided for lighting houses, lamp-posts, and the like. Use No. 18 rubber-covered copper wire, or heavier, and fasten it with insulated staples to the underside of the platform. At the joint between sections, end the wiring at a binding post, and continue

LIST OF MATERIALS

No. Pc.	Description	Size
2	Platform top	$\frac{3}{8}$ x 54 x 60
4	Framework	13/16 x $3\frac{1}{2}$ x 60
4	Framework	13/16 x $3\frac{1}{2}$ x $52\frac{3}{8}$
4	Cross bracing	13/16 x $3\frac{1}{2}$ x 80
2	Aprons	13/16 x 6 x $121\frac{5}{8}$
2	Aprons	13/16 x 6 x 54

NOTE: All dimensions given in inches. Platform made of fir plywood, other pieces of pine.

31 carriage bolts, $\frac{1}{4}$ in., $2\frac{1}{2}$ in. long.
1 gross $1\frac{1}{2}$ -in. No. 7 flathead wood screws.

2- $2\frac{1}{2}$ -in. No. 7 flathead wood screws.

36 radio or clip type binding posts.
75 ft. No. 18 rubber-covered copper wire.

it again on the other side from another post. A short jumper will then complete the circuit. In all these circuits, install additional binding posts every 12 or 18 in. Leads from the ends of the circuits are connected to transformers or run to a control panel.

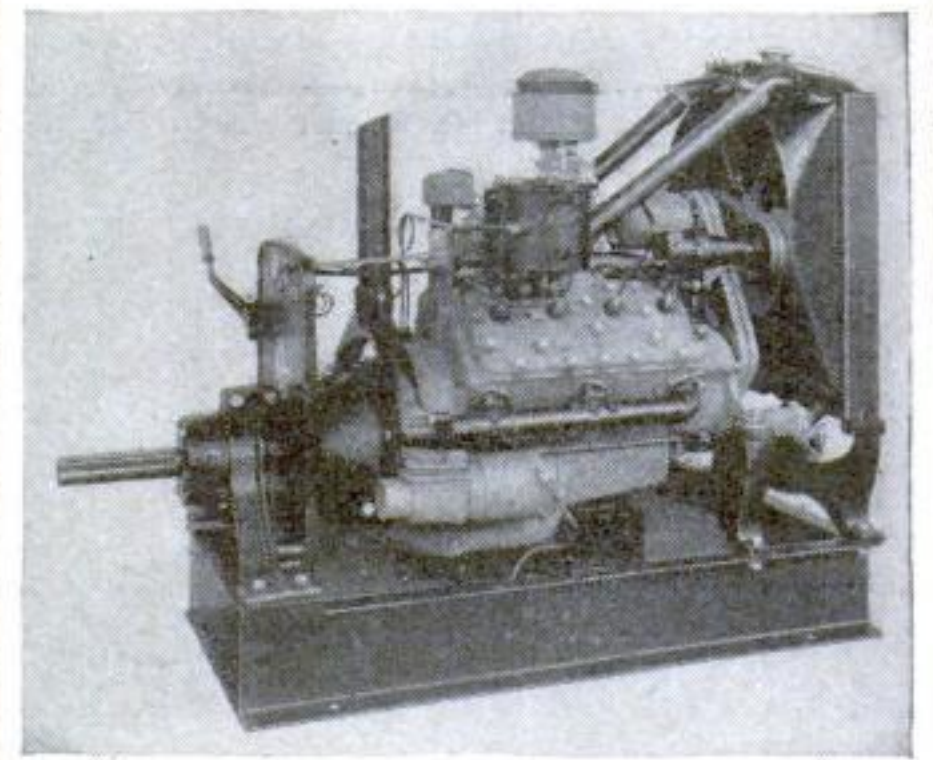
Roads are laid out on the platform, shellac is brushed on between the lines, and fine sand is sprinkled on. In the same manner, sawdust can be dyed green and applied to form grass plots. It is also well to brush shellac on the underside of the platform to protect the wood from moisture.

Three wood trestles, about 18 in. high and 4 ft. long, will support the platform. Of course, any number of similar platform sections can be made to suit special display requirements.

Making Rope Coils to Hang on Model Belaying Pins

COILED ropes' ends to hang on ship model belaying pins are easily prepared by driving two long, thin headless nails a short way into a board. It is best to have the nails project horizontally. Twist the cord over and under them in figure-8 fashion several times, and seize (bind) the coil at the crossing of the 8. Apply a touch of lacquer or model airplane "dope" and push the coil toward the base of the nails to dry while another is made.—JOHN HINTERHOFF.

CAN YOU BEAT THESE POWER COSTS?



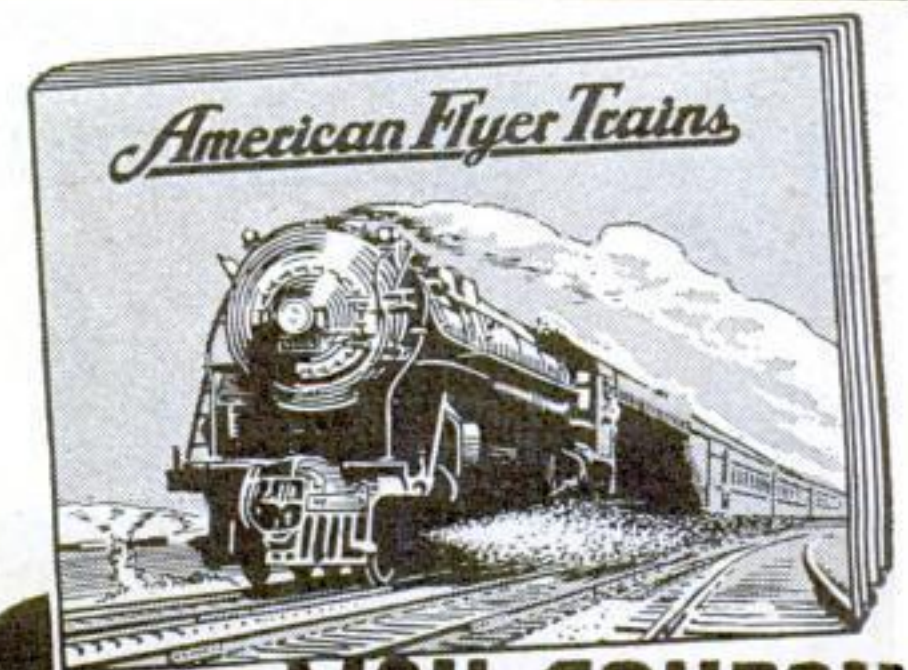
Save up to \$293.80 per month on power costs with a KRW FORD V8 UNIT
50 H.P. with KRW V8 Unit using natural gas (1125 BTU) @ 30¢ per 1000 cu. ft. **\$46.80** per month
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Above figures show primary fuel costs (lubricating oil not included) for operating a KRW-V8 Unit to develop 50 H. P. for 10 hours per day—26 days per month. Compare this with electricity @ 3¢ per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks out of actual savings!

KRW-V8 Units are daily saving money for operators of air conditioning and refrigeration equipment, mills, factories, shops, welders, compressors, pumps, well-drilling outfits, contractors' equipment, etc., etc.

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1937 INDEX

of Expanded Home Workshop — 10 Cents

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You do not have to fill out a coupon or write a letter. Merely address Popular Science Home Workshop Index, 353 Fourth Avenue, New York, and inclose ten cents together with a large return envelope addressed to yourself. Do not put a stamp on the return envelope which you inclose; we will pay the postage when we mail the Index to you.

There are still a few copies of the 1936 Index available at the same price of ten cents. Send twenty cents if you wish the Indexes for both years.

Check List of Jobs for DECEMBER

WHY not end the year right by making those home improvements you put off doing during the summer and fall? Now is the ideal time. A few suggestions follow:

- Inclose porch for winter use.
- Erect storage racks and shelves in garage.
- Install new sink and drain board in kitchen.
- Insulate cellar walls and cold water pipes to minimize condensation.
- Construct dressing table and stool for bathroom.
- Build additional equipment and furniture for playroom.
- Construct removable winter vestibules for outside doors exposed to cold winds.
- Turn off water from outdoor fixtures likely to freeze, or protect them with heavy insulation.



Put a
ring
around
this

*it's better
smoking
tobacco*

..and here's
why



- aged-in-wood
Burley tobacco
- extra good taste
- for pipe or
cigarette

**2 full ounces
in every tin**

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DRIVE
or
DRAW
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RATCHET
AT CENTER
MAKES
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**FINE FOR
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**"YANKEE"
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Driving screws made easy, quick, *interesting*—for man, woman or boy! Amazing Value! \$1.00 buys "Yankee" No. 33H with one blade at your dealer's... ALSO, dealer can supply "Yankee" Attachments to make this *Handyman* bore and countersink holes for screws. Shown below.

**"YANKEE" CHUCK & 3 DRILLS - Fit in Place of Blade
Set 39c**

"Yankee" Chuck

"Yankee" Drill 5/64"

"Yankee" Drill 7/64"

"Yankee" Drill 9/64"

**"Yankee" Countersink
Each 25c**

**"Yankee" 5/32" Blade
for small screws, each 12c**

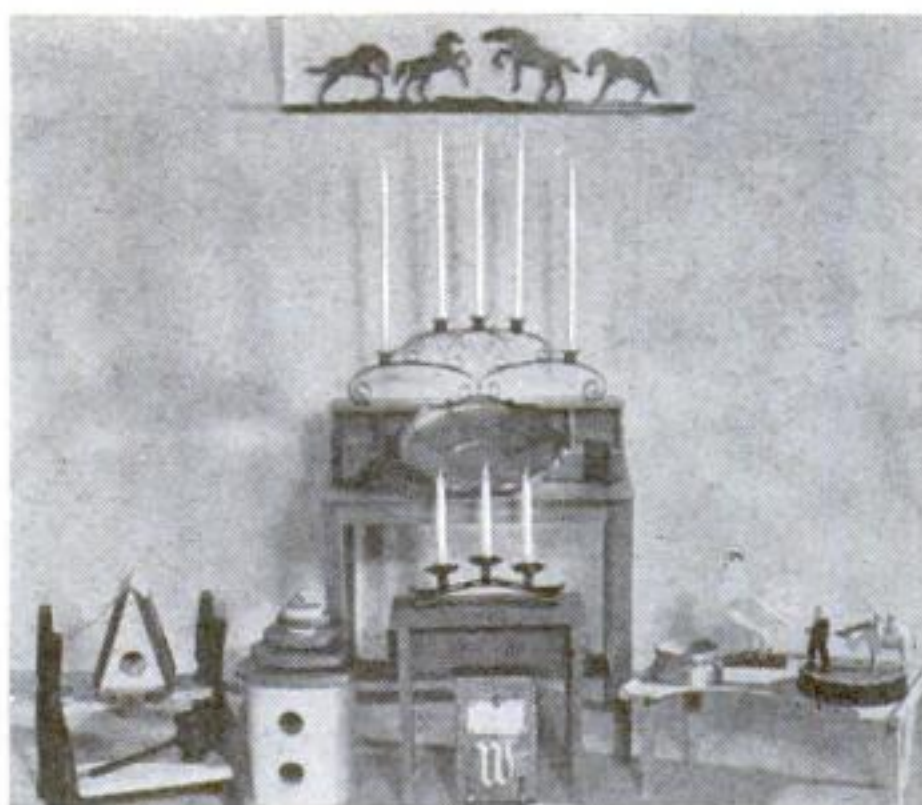
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NEW TOOL! If not at dealer's send \$1.00 for "Yankee" Handyman and one blade. "Yankee" Tool Book, included FREE.

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Guild Clubs Active as Season Starts



Craftwork in wood and metal by members of Newcastle (Calif.) Homeworkshop Club

REPORTS from clubs affiliated with the National Homeworkshop Guild indicate that improved craftsmanship and better club programs are in evidence everywhere as the new season gets under way. The Guild's free services have spurred the clubs on to more ambitious undertakings, and the 1937-38 activities promise to be the most successful in Guild history.

Demonstrations in metal spinning, wood turning, and wood carving have been arranged by the *Saginaw (Mich.)* Homecraft Club, in addition to moving pictures and talks by men from various industrial units of the city. A successful exhibition was held in connection with the Saginaw County Fair.

Work on ship and railroad models occupies the attention of the Domestic and Juvenile Court Homeworkshop Club of *Toledo, Ohio*, on Wednesday nights of each week. On Friday nights the more experienced members act as instructors for Boy Scouts and a boys' club.

"The publicity given our club in various newspapers and our own club activities have resulted in the largest membership we have ever had," reports William Graf, secretary of the North Shore Craftsman Club, *Waukegan, Ill.* "One of the most interesting things we have in our workshop is a wall case where members display small projects. It gives each member an idea of what his fellow members are doing, and visitors are entertained and inspired by the exhibit."

Construction of a miniature water wheel for a small stream that flows through the rock garden of one of the members was the main project at a recent meeting of the *Brockton (Mass.)* Homecraft Club. The women members made flowerpot wall brackets and trellises. Another coöperative enterprise is the building of a dog house for a large collie. Several attractive wall plaques have been made by pasting pictures on plywood, cutting around the edges, and tacking each cut-out on another piece of plywood, which is framed with a light molding.

The *Ware (Mass.)* Homeworkshop Club plans a vigorous membership

(Continued on page 117)

**YOU'RE CRAZY—
IF YOU DON'T CLEAN
OUT YOUR RADIATOR
BEFORE YOU USE
ANTI-FREEZE!**



DO IT FOR 10c WITH SANI-FLUSH

NEVER put anti-freeze in a dirty, clogged radiator! You waste anti-freeze. You run the risk of an overheated engine and expensive repair bills. Sani-Flush removes all rust and sediment from the radiator. It's easy to use, and inexpensive.

Just pour some Sani-Flush in the radiator. (Follow directions on the can.) Run the motor. Drain, flush and fill up with anti-freeze. Then you're set for a winter of safety. You won't lose anti-freeze. Poor circulation won't spoil the efficiency of your motor. Sani-Flush can't hurt aluminum cylinder heads or motor parts. You'll find it in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores—25 and 10 cent sizes. The Hygienic Products Company, Canton, Ohio.

Sani-Flush **Safe**
KEEPS RADIATORS CLEAN NOT CAUSTIC

The modern
NON-SKID
SCREW DRIVER



**... won't slip
out of the slot**

It's simply surprising how the NON-SKID Point grips the walls of the screw slot... no pushing required—just turn. No slipping... no injured fingers... no damage to polished surfaces. Then there's the chrome alloy steel blade... and the highly-insulated, hammer-proof EBONY handle. And you'll like the "feel" or balance of this extra fine tool. See it at your Hardware Dealer's today. Guaranteed by The Bridgeport Hardware, Mfg. Corp., Bridgeport, Conn., U. S. A.

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If your Dealer is out of NON-SKIDS, simply mail us 50¢ in stamps for the popular 4" size (overall length 8 inches).

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Guild Clubs Active

(Continued from page 116)

campaign this fall. Julian Knapp exhibited plans of his new home, which he will construct himself. Edward Gosse- lin has made several combination kitchen stool and ladder chairs. D. C. Milligan is making a working model of a naval cannon. Leopold Mozdierz has passed his test for a limited commercial pilot's license.

R. D. Harris, secretary of the *Mansfield (Mo.)* Homeworkshop Club, visited home workshops in several states during a tour last summer. W. M. Young is building a house trailer, and Mr. Harris has completed a dog trailer.

Plans have been started for the annual exhibition of the Capital Home- craft Club of *Washington, D. C.* George A. Simonds has been named general chairman, assisted by Harry E. Middleton, Orrin Davy, Edgar W. Parks, Joseph Chlopicki, and C. T. Kingsbury.

The Science Homeworkshop Club of *Brooklyn, N. Y.*, has reelected the following officers: Morris Horowitz, president; Hyman Cohen, vice president, and Abraham Eisenstadt, secretary-treasurer. During the past year the club studied photography and electricity and made small electrical projects under the supervision of Mr. Horowitz.

A wood-turning demonstration was given recently before the *Denver (Colo.)* Homeworkshop Club. Christmas projects were started.

Lawn chairs were made and sold by the *Orange, (N. J.)* Homecraftmen Club last summer and the money used to purchase supplies for the club's workshop. At present old toys are being repaired to be given away to poor children at Christmas. Several of the members are building a file and rack to hold Guild bulletins, blueprints, magazines, and catalogues.

Tracing Half-Breadth Ship Model Plans

MANY methods of transferring the lines of the half-breadth plan of a ship model drawing to the wood have been suggested, but I have found a way that eliminates the errors often caused by creasing paper along the center line.

A fairly large sheet of glass (I use a piece 14 by 35 in.) is placed across two boxes or chairs, and a lamp is set below it. Lay the plan on the glass and cover it with white paper. Draw a line on the paper to coincide with the center line of the plan. Then trace the required water line.

Turn the paper face down, align the center line and the ends of the water line with the plan, and trace the water line again. This gives the complete lift, but the shape of one half is on one side of the paper and that of the other half is on the other side. Remove the original plan, lay the white paper down again, and trace the water line as seen through the paper so as to get it all on one side of the sheet. The shape may then be cut out.—CHARLES C. CONLON, JR.

YOUR OWN EYES DO THE SHOPPING

When you go to the hardware store to buy a file, the clerk no longer pokes through boxes, unwraps yards of brown paper * * Your own eyes do your shopping, without delays . . .

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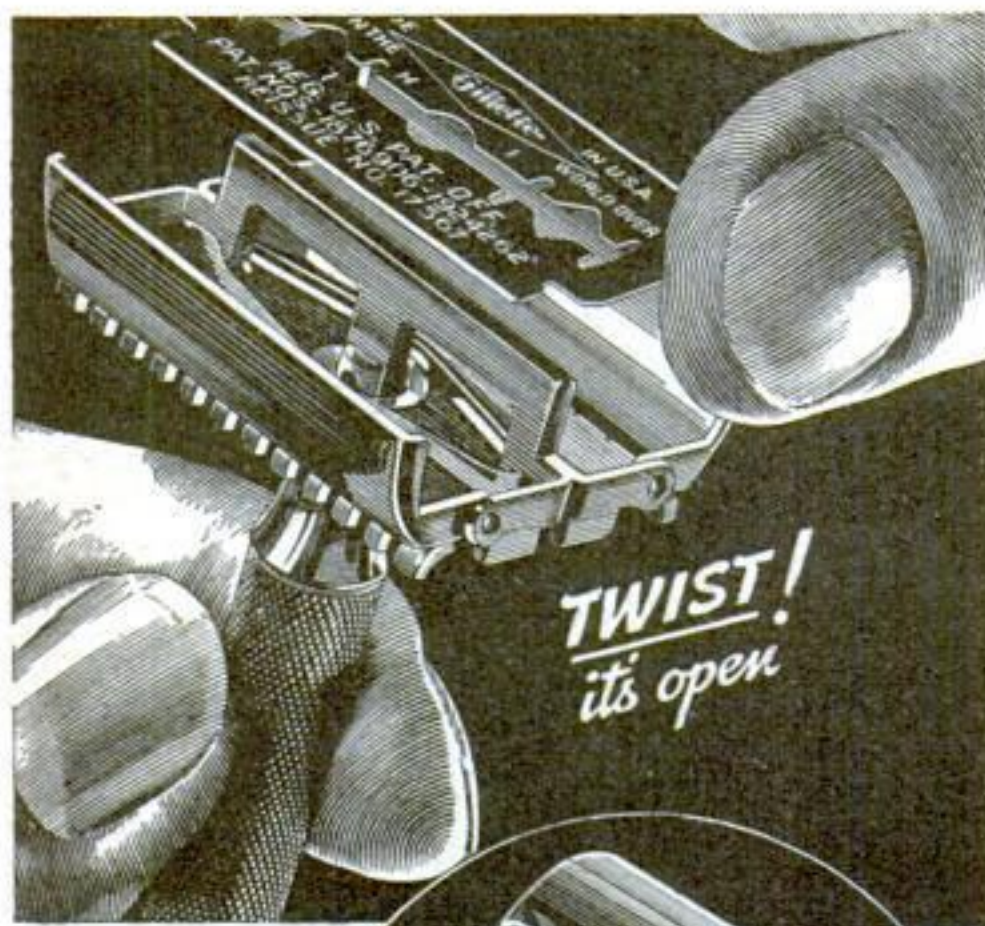
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Blades Changed In 3 Seconds



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ANOTHER sensational Gillette manufacturing triumph! Today you can buy, for just 98¢, a genuine 1-piece Gillette Razor—the *Sheraton*—in an attractive traveling case with 5 Gillette Blades! Until now, we have never been able to make a razor of this type to sell for less than \$4 list. Output is limited. Millions will want one. You may have to ask your dealer to get yours on special order.

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Gillette

RAZORS AND BLADES

Modern Doll House Folds Flat for Storage

(Continued from page 97)

the shoulders at each end, cut a ¼-in. wide slot as shown to hold the second floor in place.

The three pieces of plywood used in each end section should be laid out to leave the least wastage, according to the size of your panel. There are two pieces of plywood 10¼ by 15 in. and one piece 12 by 15 in. The windows and doors may be laid out to suit your own taste. Attach the corner posts flush to the ends of the 12 by 15-in. piece, and hinge the other two as illustrated. The

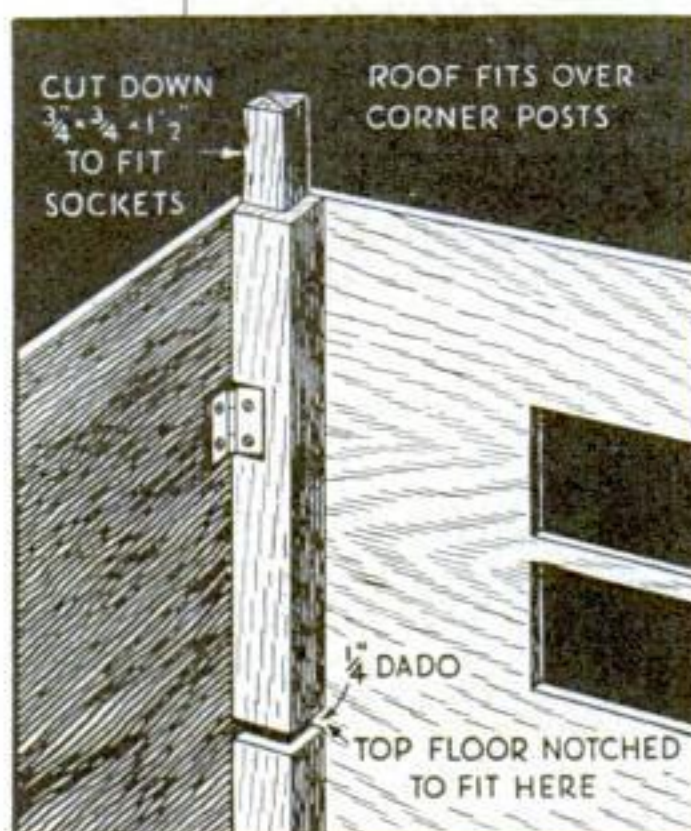
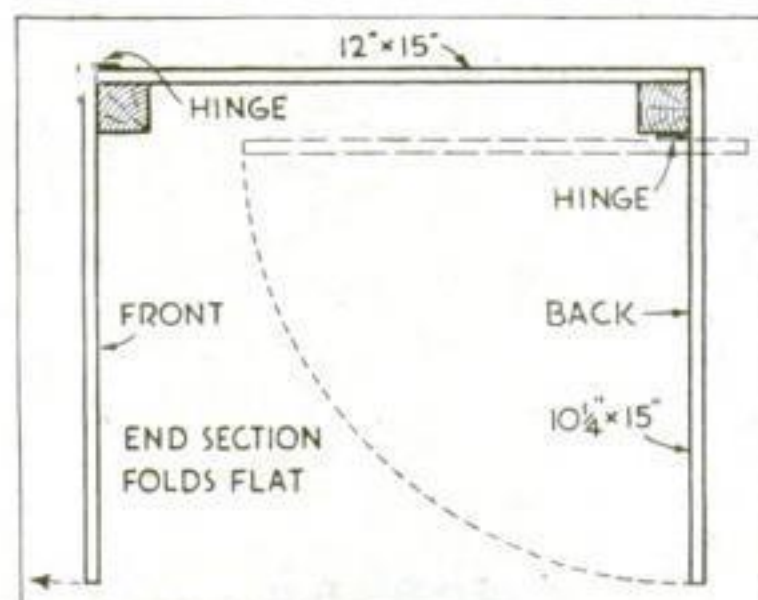


Diagram showing how each end section is folded, and corner construction from inside

drawings above show how the end section folds up. Note particularly that the front is hinged on the outside and the back on the inside.

The partitions, one of which is used on each floor, are made as in another drawing. The molding, grooved by a simple dado operation, acts as a base for the partition. The door is hinged, and the molding is glued on.

Finishing depends principally on how much effort you wish to put into it. The wood may be roughened with coarse sandpaper, and a thinly mixed coating of cement or plaster applied. A flat wall paint or cold-water paint can be used, if desired, but if this is done the wood should first be primed or sized with shellac or glue sizing.

A folding porch or solarium may be added to one end. An awning of bright colors over each window will improve the appearance, as will a flagstone terrace in the front. You might try a fireplace with the chimney running up the outside of the house—detachable, of course—and cut a hole in the wall to suit. Other refinements may be added, or the same general method of construction applied to a house of different design.



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Street

City State

PLEASE PRINT PLAINLY

Preparing Crystallized Christmas Trees

(Continued from page 76)

fect is obtained by using sprayed aluminum bronze. This, too, can be applied in a clean, dry garden sprayer if a little care is taken to get the mixture right. It is suggested that $\frac{1}{4}$ lb. of aluminum bronze powder, varnish-mixing grade, be wet slightly with turpentine to a smooth paste and then continuously stirred while a pint of quick-drying varnish is added. Thin this with either turpentine or gasoline until the mixture sprays easily with the gun you are using. Do not smoke while doing this, and do not work where the fumes can reach a fire in furnace or stove, as the tree, varnish, gasoline, and aluminum constitute a very dangerously inflammable mixture. The finish is safe enough, of course, once it is dry.

Let the first coat dry hard and touch up where required, or give a second coat. Avoid getting the mixture too wet in spots or it will sag to the edge of the needles, strip off the bronze, and produce an unsightly result. Spray on lightly and evenly while moving around the tree in a methodical manner. Be sure to clean your sprayer thoroughly without delay. Let the tree dry hard before taking it into the house.

Bear in mind that lime in calcimine is disastrous to conifers. On live trees it can be used only above ground and for a short period, when it must be removed without having any of it wash down into the soil where it would come in contact with the roots and thus kill the tree. If a live tree is treated, follow exactly the method previously specified.

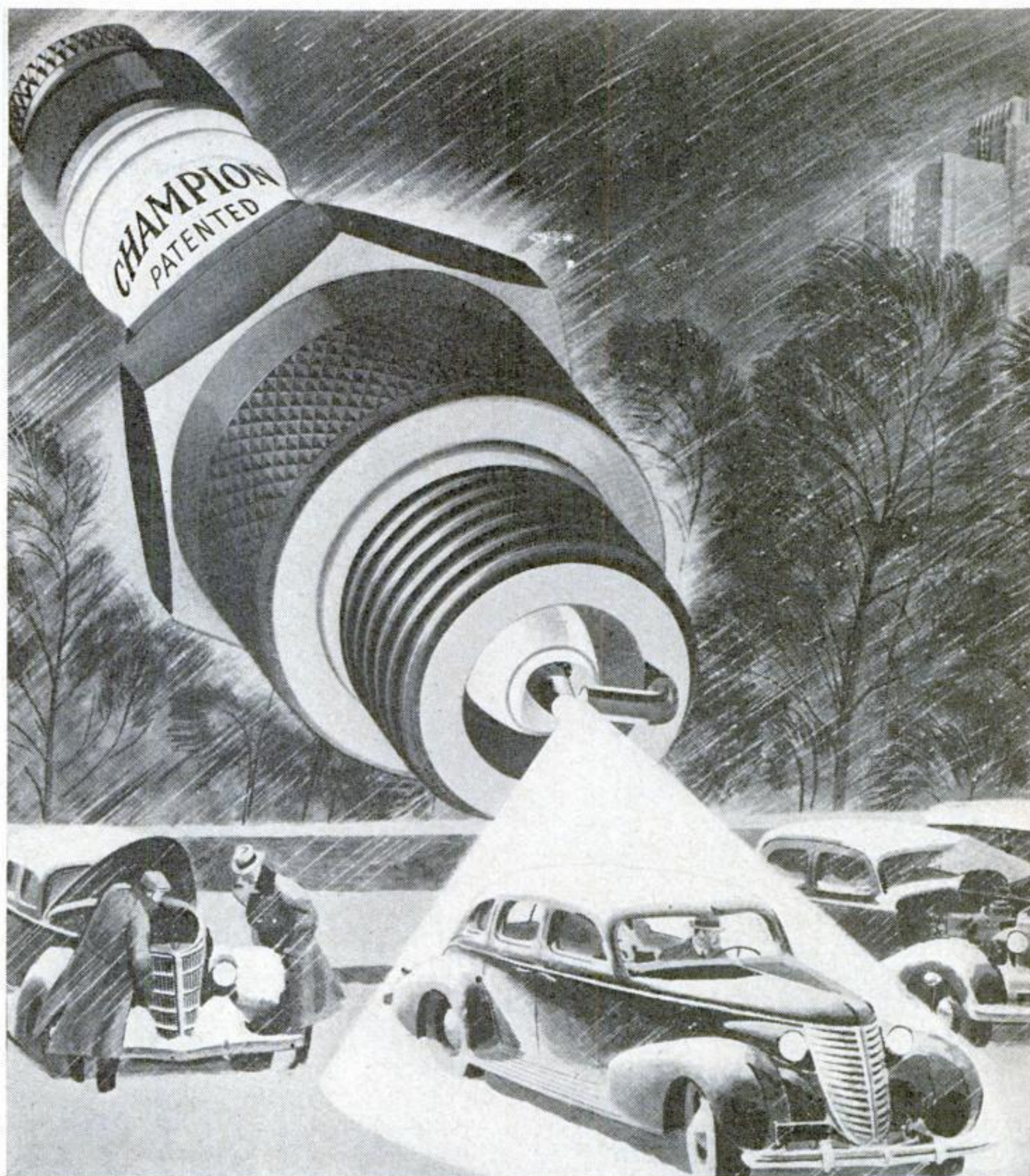
Valuable Papers Recorded by Your Movie Camera

MANY amateur movie makers with 8- or 16-mm. cameras are using the last few feet of film remaining on the reel to photograph canceled checks, technical data, clippings, and letters as a matter of record. A great volume of such records will take up surprisingly little room in a safe deposit drawer and in the event of fire or flood may prove invaluable.

Lay the sheets to be recorded face up on a table near a wall. Support the camera, lens down, about 42 in. above the table on a bracket fastened to the wall. Illuminate the copy with three photoflood lamps about 24 in. above the table. Set the camera diaphragm at F/5.6. An instantaneous click of the shutter button will expose no more than two or three frames of the film.

These record frames, of course, have to be edited from the reel after development. When required, the photographed copy can be easily read with a low-power microscope, or can be enlarged photographically.—A. W. E.

Organize a home workshop club. Send a stamped, self-addressed envelope for full particulars.



EASY STARTING DEPENDS ON SPARK PLUGS

**YOU CAN
DEPEND ON
CHAMPIONS**



A hard starting car is an aggravation, particularly in cold weather. It invariably indicates that gas mileage, power, speed and acceleration have declined badly—performance is seriously impaired.

Spark plugs are all important in maintaining topnotch engine performance. Inferior quality or worn-out spark plugs are a great handicap to even the best modern engines and the best of modern high performance fuels.

Change to new Champion Spark Plugs now and note the new speed with which your engine starts, the renewed ability to accelerate and the measurable increase in gasoline mileage.

Champion Spark Plugs for a quarter century have continued to set new high standards of performance and reliability in engines everywhere. We sincerely believe you cannot afford to accept spark plugs less dependable than Champions.

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Taps Standard Machine Screw Thread in Materials of practically any thickness!

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U. S. Patent Nos. 1,862,486; 1,909,476; 1,909,477. Other Patents Pending. Foreign Patents.

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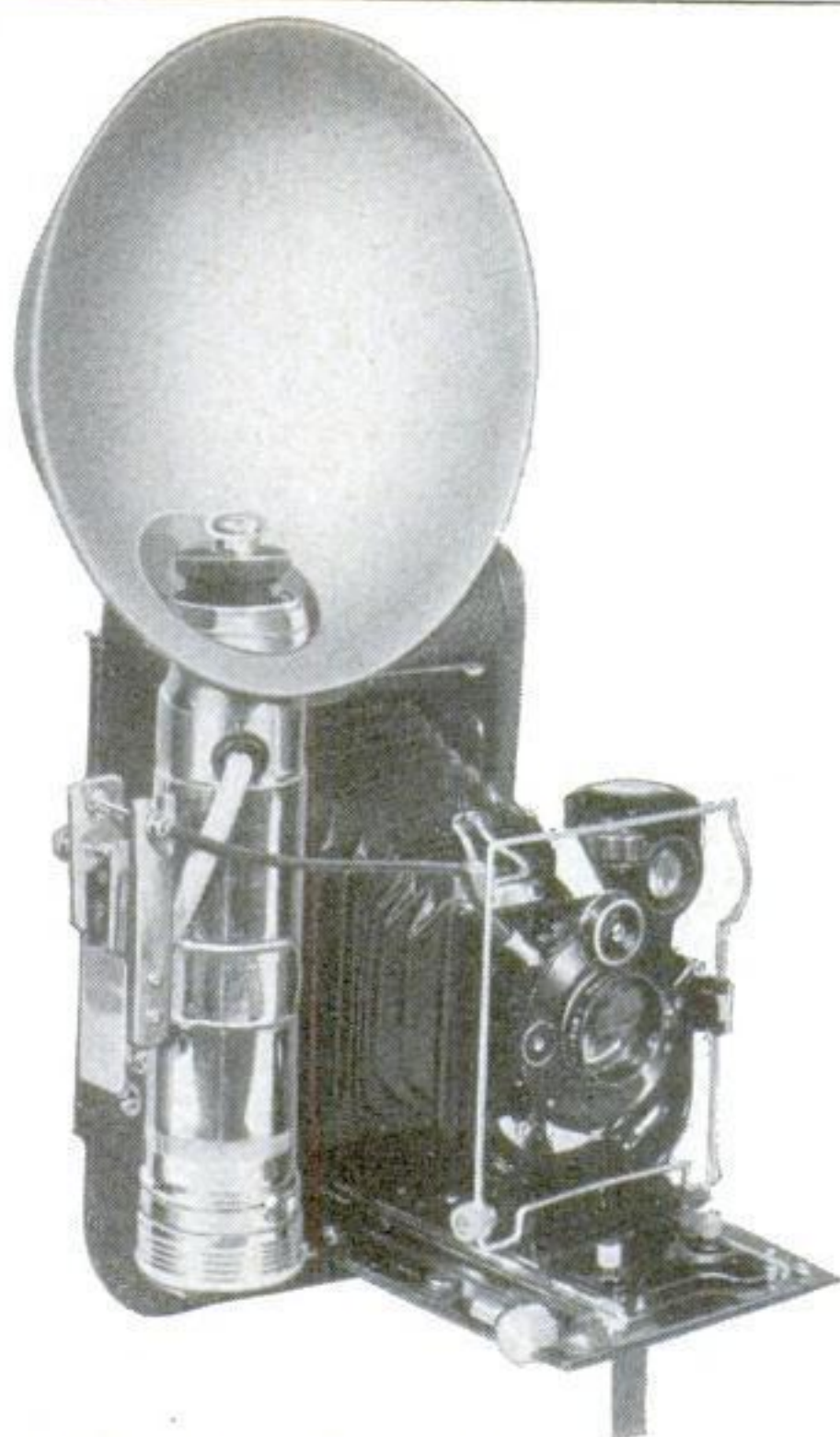
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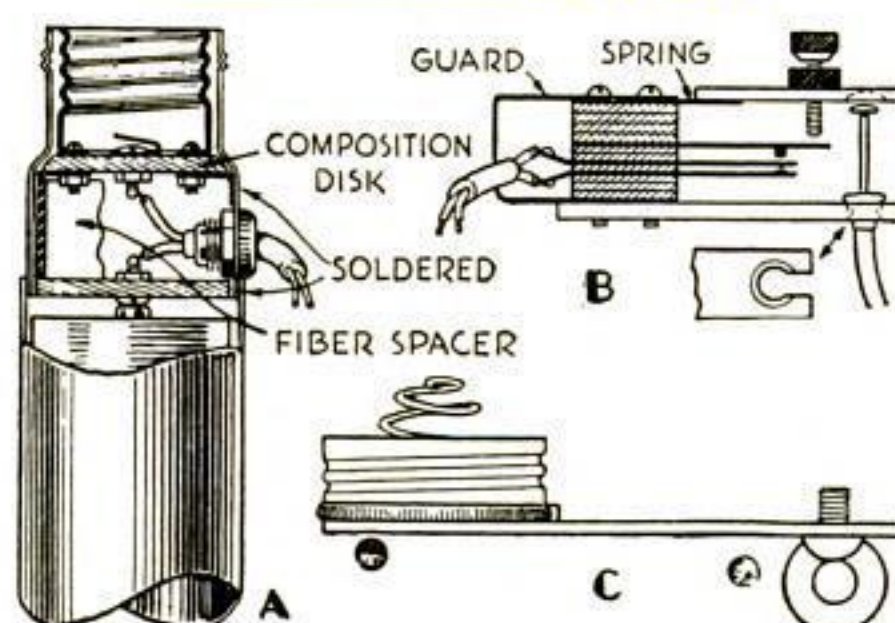
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A second disk with a contact bolt in the center is located at the bottom of the shell. A spacer to hold the two disks the proper distance apart is cut from the fiber socket liner. After the wires are soldered, this bottom disk is held by bending the edge of the shell inward in three or four places. The wires enter the socket through the hard-rubber bushing, which is placed through the key slot in the side of the shell.

The battery case is an old three-cell
(Continued on page 121)



Cutaway view of the socket, the remodeled phone jack, and bracket with camera screw



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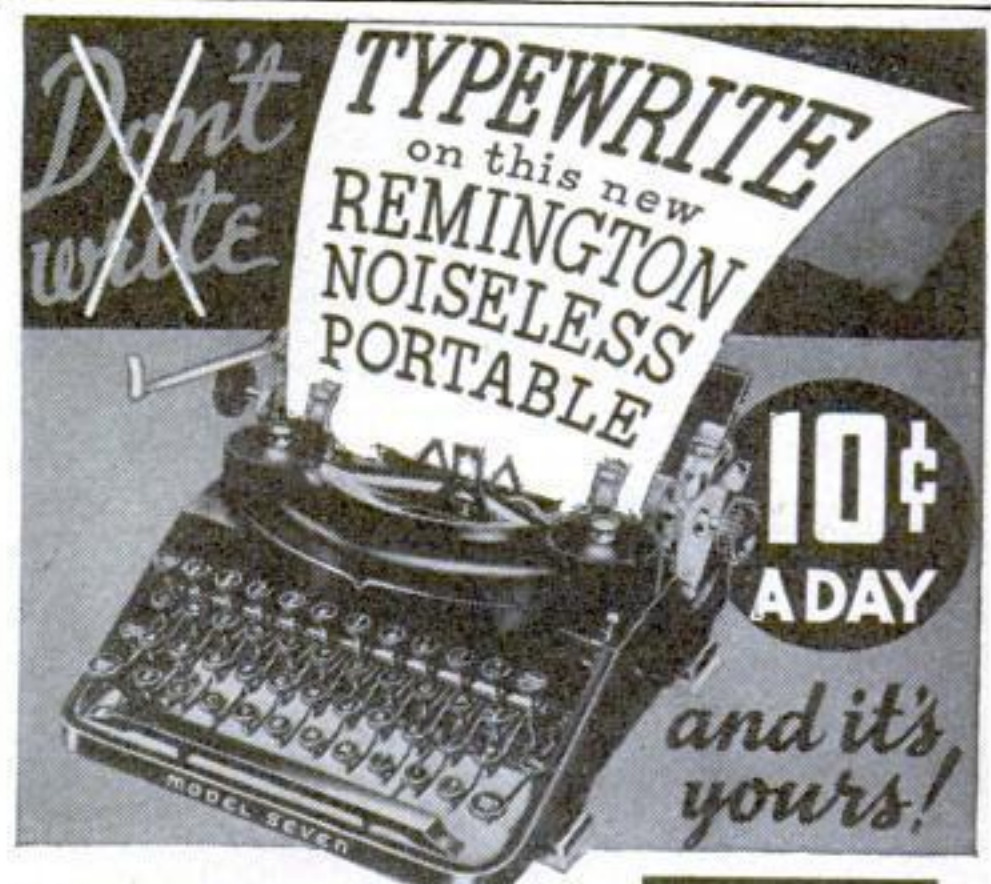
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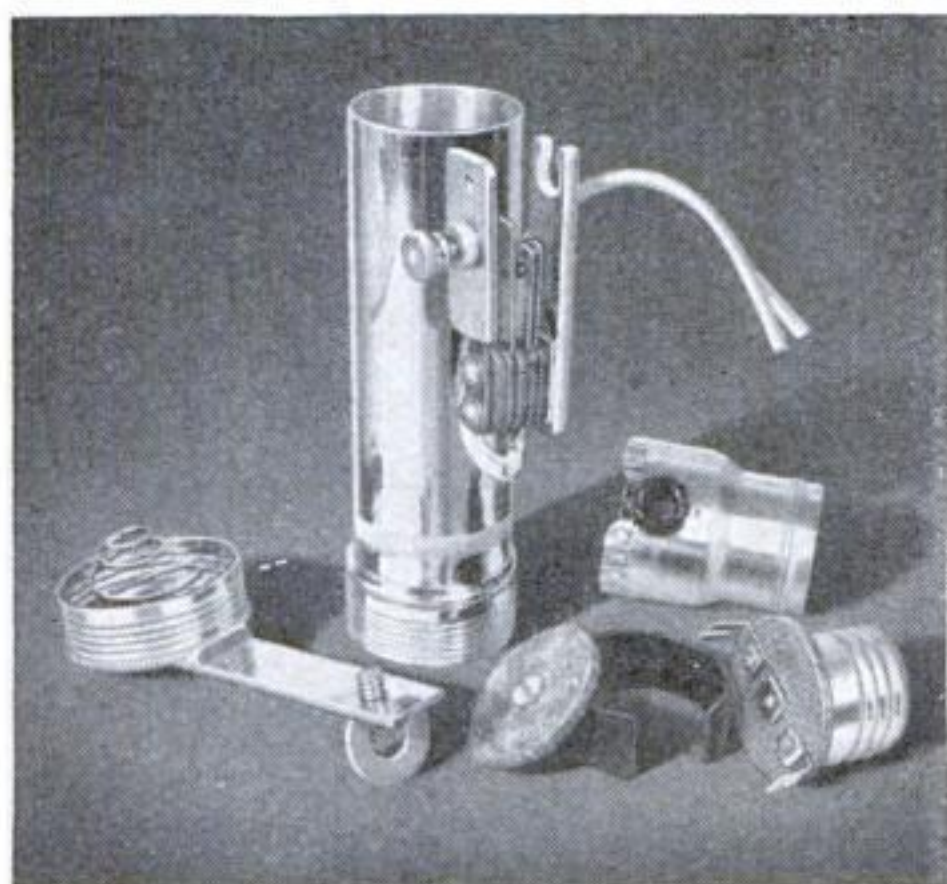
Flash Synchronizer

(Continued from page 120)

metal flash light with the end containing the switch cut off. The length should be two battery cells plus $\frac{1}{8}$ in. for soldering and $\frac{1}{4}$ in. for the spring in the cap.

The combination switch and shutter release is made from an old radio phone jack of the type shown at B. The base bar of the jack is cut to a length that will allow the cable release plenty of clearance past the ends of the contact springs. The countersunk hole near the end of the bar is made to fit snugly behind the head of the cable. A slot is cut from the end of the bar into this hole to allow the cable to be disconnected from the switch.

The push plate is of metal $\frac{1}{8}$ in. thick and $\frac{1}{2}$ in. wide and of a length to suit the jack used. To the end of the plate, a short length of light clock spring is soldered. Two holes are drilled in the spring to correspond with the switch assembly screws. A hole for the adjustment screw is drilled and tapped as shown, and the screw is provided with a lock nut. Another hole, of a size to receive the push button of the cable



The synchronizer parts before assembly

release, is drilled almost through the push plate directly opposite the cable hole in the base bar.

The switch is mounted on the side of the battery case with a sheet metal bracket, which is soldered solidly to the case, and in which holes are drilled to fit the two switch assembly screws. The wires from the socket are brought down to the switch and soldered. A guard of light sheet metal is made to protect these connections.

The bracket for attaching the device to the camera is a $\frac{1}{8}$ by $\frac{1}{2}$ -in. bar, soldered on as at C. The camera screw is an ordinary $\frac{1}{4}$ -in., 20-thread stove bolt with a washer soldered into the slot. The threads are filed off the screw for $\frac{1}{8}$ in. next to the head to allow the screw to turn freely after being run through the threaded hole in the bracket bar. A square shoulder of solder is built up on top of the bar next to the cap to prevent the synchronizer from turning out of line. This shoulder should fit snugly against the edge of the camera bed.

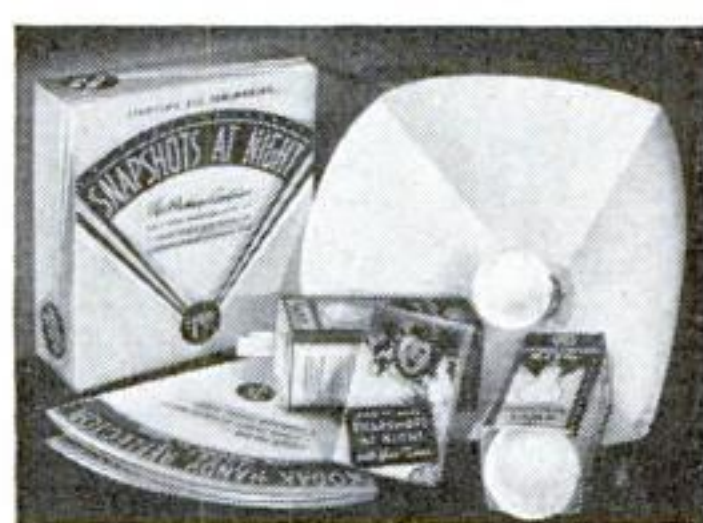
(Continued on page 138)

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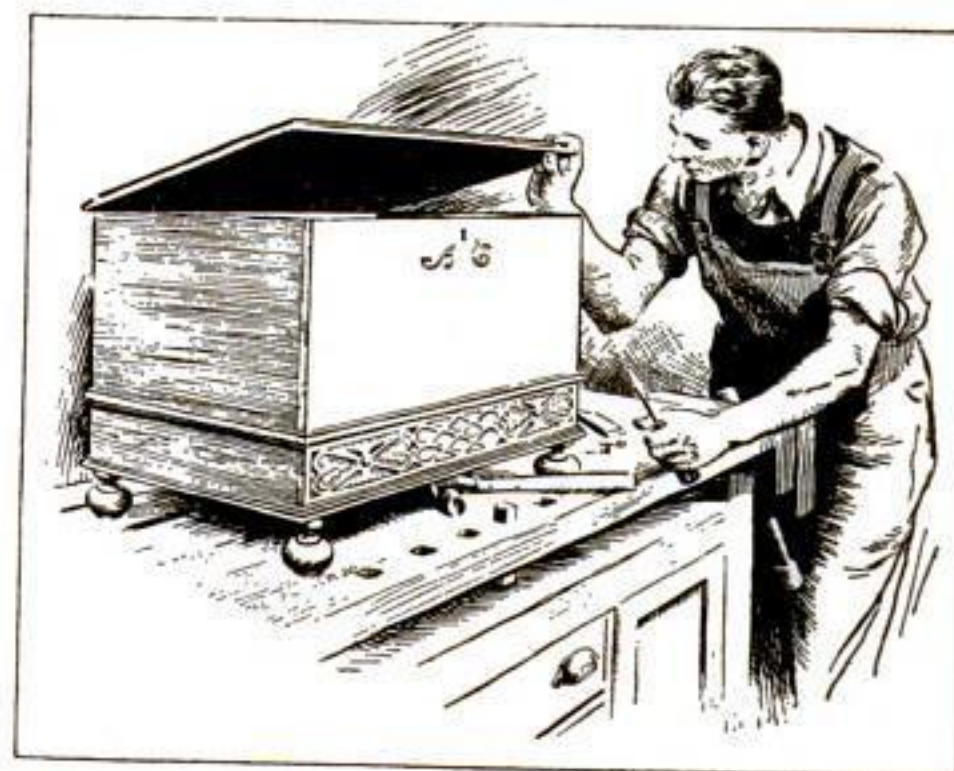
*Clipper Ship <i>Great Republic</i> (31½ in. hull), 272-273-274-R	\$1.25
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Drafting Table, 189A	.25
*Farragut's Flagship <i>Hartford</i> (33½-in. hull), 221-222-R	1.50
Folding Duck Boat (13-ft.), 170-R	.50
*Gettysburg Cannon Model (11½-in.), 292A-293A	.75
Magazine Rack and Wooden Wastebasket, 296A	.25
*Racing Sailboat <i>Blackcat</i> , 13 ft. 4 in. long, 5-ft. beam, weighs 250 lb., Marconi rigged, 321-322-323-R	1.00
Smoking Cabinet, 2	.25
*Sovereign of the Seas, Clipper Ship (20½-in. hull), 51-52-53-R	1.00
*U. S. Battleship <i>Texas</i> (3-ft. hull), 197-198-199-200	1.00
*U. S. Destroyer <i>Preston</i> (31½-in.), 125-126-127-R	1.00
*Utility Rowboat (13 ft. long), 224-R	.50
*Whaling Ship <i>Wanderer</i> (20½-in. hull), 151-152-153-154	1.00

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Kitchen Table Cabinet, 27	.25
Mirror Frame, 246A	.25
Modernistic Folding Screens, 91	.25
Modern Tea Wagon and Cabinet into which it Rolls, 313A	.25
Mosaic Serving Tray, 297A	.25
Pier Cabinet, 77	.25
Queen Anne Dressing Table, Stool, and Mirror, 295A	.75
Sewing Cabinets, Priscilla and modern, 31	.25
Sewing Table, 1	.25
Silver Chest on Stand, 256A	.25
Small Early Colonial Pine Chest (illustrated above), 308A	.25
Telephone Table and Stool, 18	.25
Tilt-top Table, 140	.25

GIFTS FOR BOYS

*Barbary Pirate Galley (20-in.), 44-45-R	.75
*Brig <i>Malek Adhel</i> , 20-in. hull, frame-and-plank construction, 304-305-306-R	1.00
Clipper Ship in Bottle, 121-122	.50
Cruiser U. S. S. <i>Indianapolis</i> (12-in.), 216	.25
*Flying Tractor Airplane (3-ft. wing), 50	.25
H. M. S. <i>Bounty</i> (8½-in. hull), 254	.25
Hunting Knife and Double-Decker Bed, 277A	.25
*Kayak (with sail, etc.), 192-193-194-R	1.00



Early Colonial pine chest, plan 308A, 25¢

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Liner <i>Aquitania</i> (9-in.), 225	.25
Liner <i>President Lincoln</i> (14¾ in.), 325	.25
Liner <i>Queen Mary</i> (10¼-in.), 283	.25
*Mississippi Steamboat <i>Buckeye State</i> (19½-in.), 94-95-96-R	1.00
Motor Boat (20-in. model), 196	.25
New Bedford Whaleboat, with complete equipment, 14-in. hull, 326-R	.50
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*Toy Motor Boat (29-in.), 63-64-R	.75
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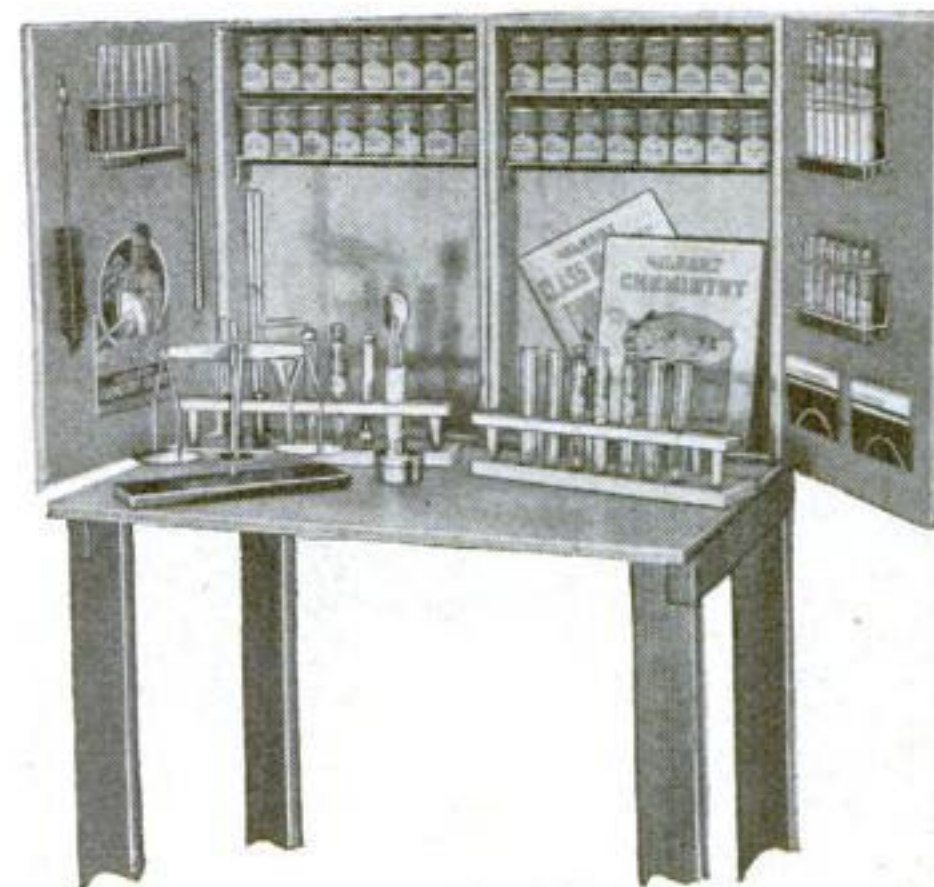
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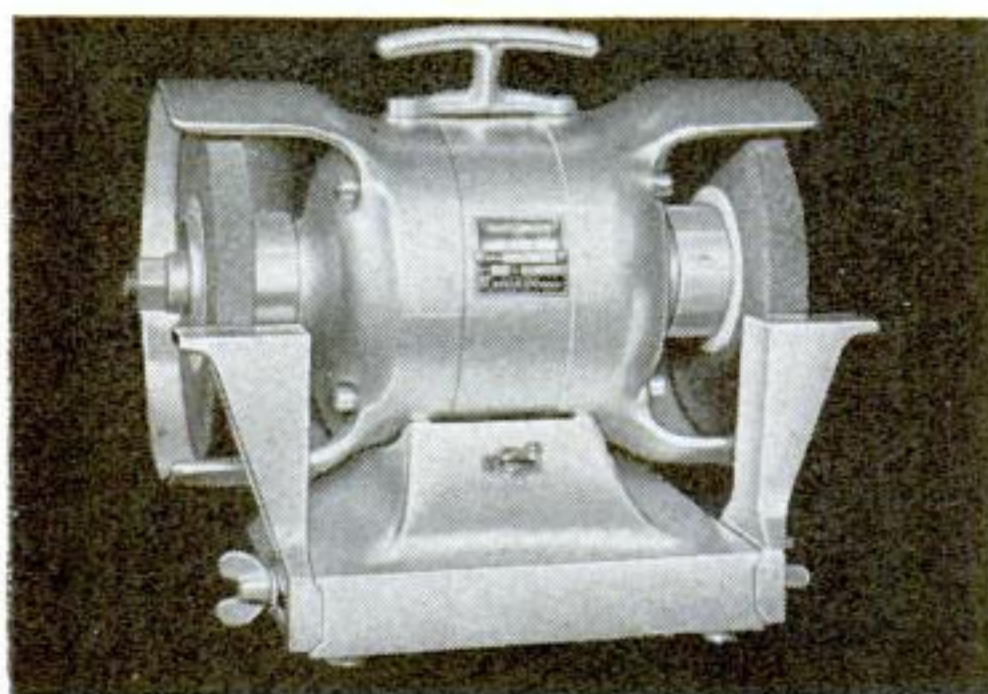
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The Expert's Way of Making Skis

(Continued from page 79)

them as shown in Fig. 2. Shave off the superfluous wood with a plane, draw-knife, or spokeshave, leaving a slight ridge at the top near *B* and *C* as in Fig. 3. Make the thinning and thickening gradual. The length of the ridge depends upon how stiff a ski you desire—the longer the ridge, the stiffer the ski. Stiff skis are excellent for racing on smooth snow, but a flexible ski is preferable for average trails, and it is better for the beginner.

To bend the tips, each must be wrapped in six layers of burlap and

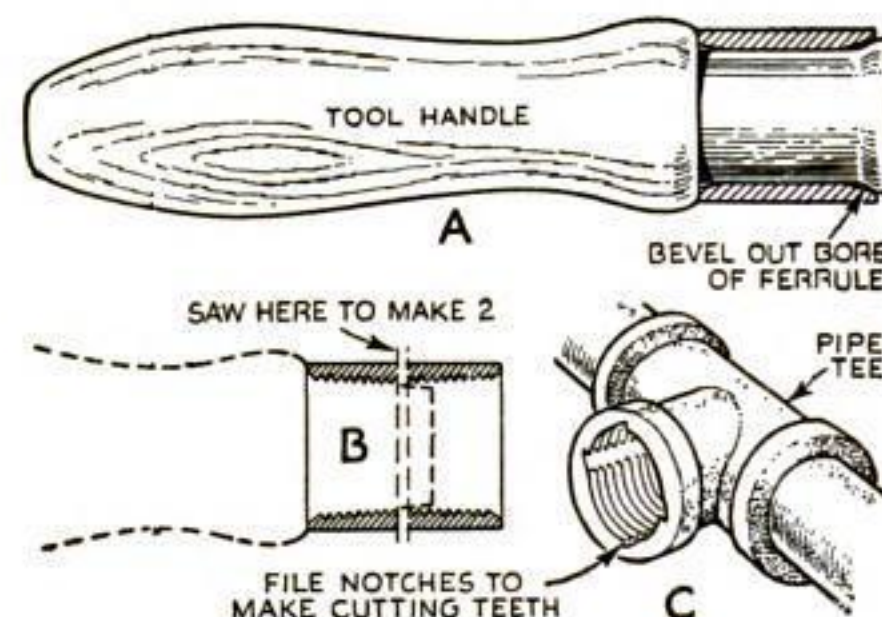
When dry, treat the running surface by rubbing wax vigorously into the wood. To obtain the best effect, first spread pure pine tar evenly over the surface and heat along the center of the ski with a blowtorch, taking care that the tar does not catch fire and the wood is not burned or the varnish on the sides blistered. As soon as bubbles appear on the surface, move the flame to the next spot. It takes about twenty minutes to do this.

After the running surface is brown from the penetrated tar, wipe off the excess with a rag. While the ski is still hot, apply a coat of so-called "hard base" or "running" wax. The skis must cool for several hours before being used. The process just described is for downhill running and for touring on very cold days. For milder weather, it is necessary to add soft wax (what is known as "climbing wax" is best).

To attach the ski to the boot, a binding or harness is necessary. The old-fashioned binding consisted of a leather strap, which passed through a mortise in the ski, and it is still seen on inexpensive skis and those made for children. The toe of the boot is merely shoved through the loop formed by the strap. Modern bindings consist of metal toe irons, either with or without leather straps, and a leather strap or steel cable that passes around the grooved or concave heel of the ski boot. Some type of clamp or tightening device is used on the harness to press the boot into the toe iron and prevent the harness from slipping off the heel. Since a serviceable binding can be bought for as little as two dollars and would be difficult and expensive to duplicate by hand, it does not pay to make it.

Good ski poles, although they present no such mechanical difficulty as the binding, are also cheaper to buy than to make.

Two Ways to Keep Ferrules Tight on Tool Handles



TWO methods of keeping tool-handle ferrules tight are illustrated. At *A*, the handle is turned oversize and the wood then rolled down until the ferrule will slip on; then the end is soaked in water to swell the wood. At *B*, half of a pipe coupling is used for the ferrule, and the necessary threads may be cut on the turned handle with a die made as shown at *C* from a pipe tee of the same size as the ferrule.—D. A. P.

WHAT LENGTH TO MAKE YOUR SKIS

RACERS and experienced skiers use a ski 6 ft. 9 in., 7 ft., or 7 ft. 3 in. long. The novice and average skier, however, should choose a ski in proportion to his height. As all distinctions between the dimensions of downhill, slalom, and touring skis have practically been eliminated, the following table will suffice:

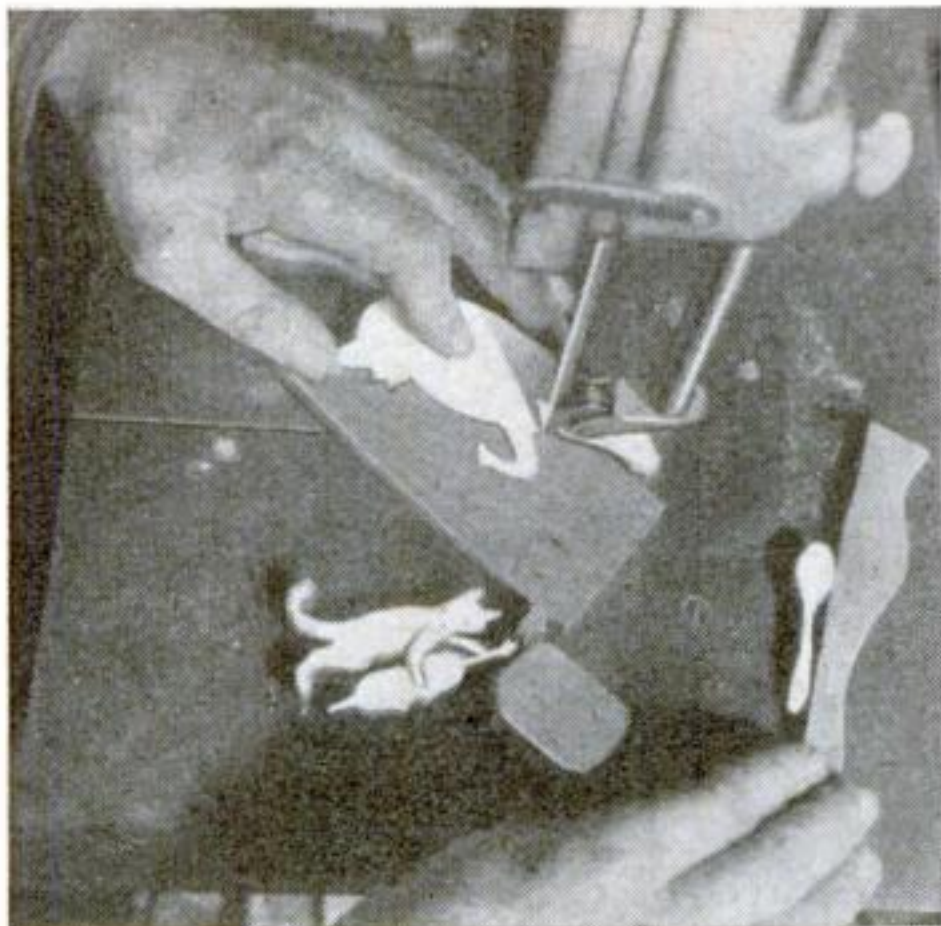
Height	Ski Length
5 ft. 2 in.	6 ft. 0 in.
5 4	6 3
5 6	6 6
5 8	6 9
5 10	7 0
6 0	7 3
6 2	7 3
6 4	7 6

If a person is very heavy, the next larger size is advisable.

tied with cord. Stick the wrapped end into a pail of boiling water for thirty minutes. Without unwrapping, place it under a board nailed to cleats about 2 in. high as shown. Bend the ski upward to a 45-degree angle. Prop it in that position and let it cool off for at least two hours. Mark its position as a guide in bending the second ski to match exactly.

The next step is to form an arch or camber under the middle section where the binding will be attached. When the skis have dried, heat them on the running (grooved) surface with a blowtorch, beginning with the back end. Make them really hot without burning the wood. Bend them inch by inch over a bench or stool, placing the back ends under the same nailed board used in the other bending operation. Move the bench gradually forward and repeat the bending process until the skis, when placed on the floor, have an arch of about 1 or 1 1/2 in. Reheat the running surface if necessary.

Sandpaper top, bottom, and sides, using plenty of sandpaper to take off excess wood on the top. Wet the skis slightly and let them dry overnight. Then sandpaper again with 00 paper. Stain and cover the top and sides with four coats of spar varnish, but do not touch the bottom.

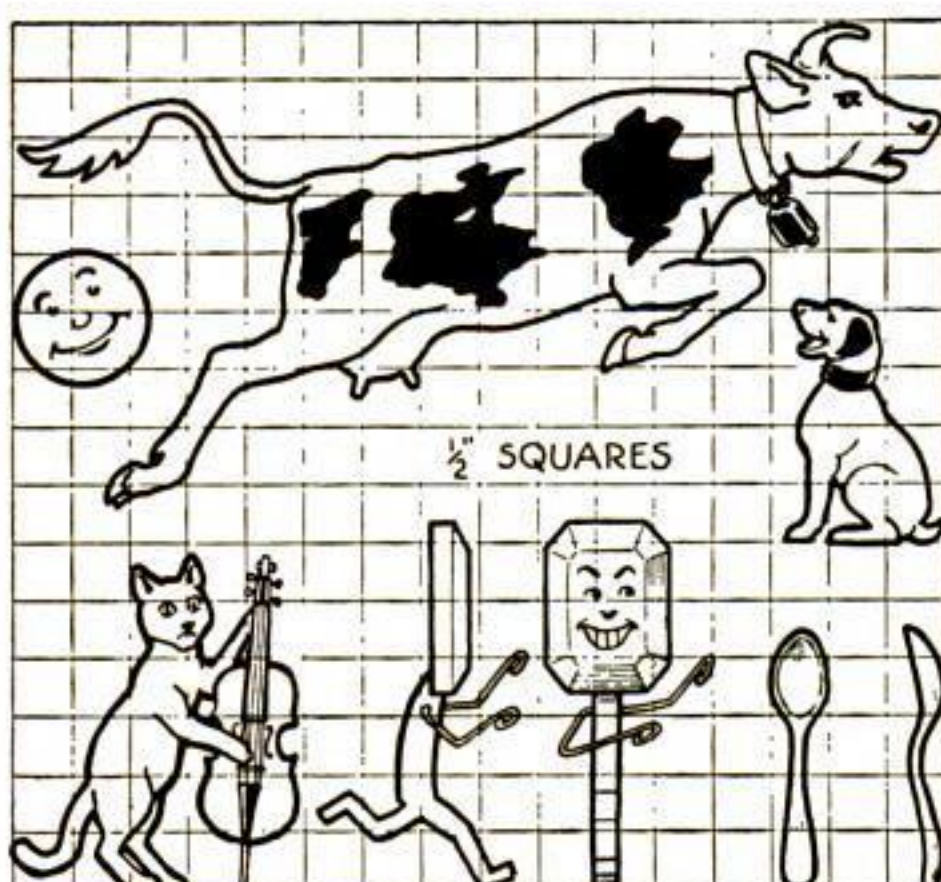


Paper patterns of all the small parts are pasted on thin wood and jig-sawed to shape

A Child's Nursery-Rhyme Rack for Storybooks

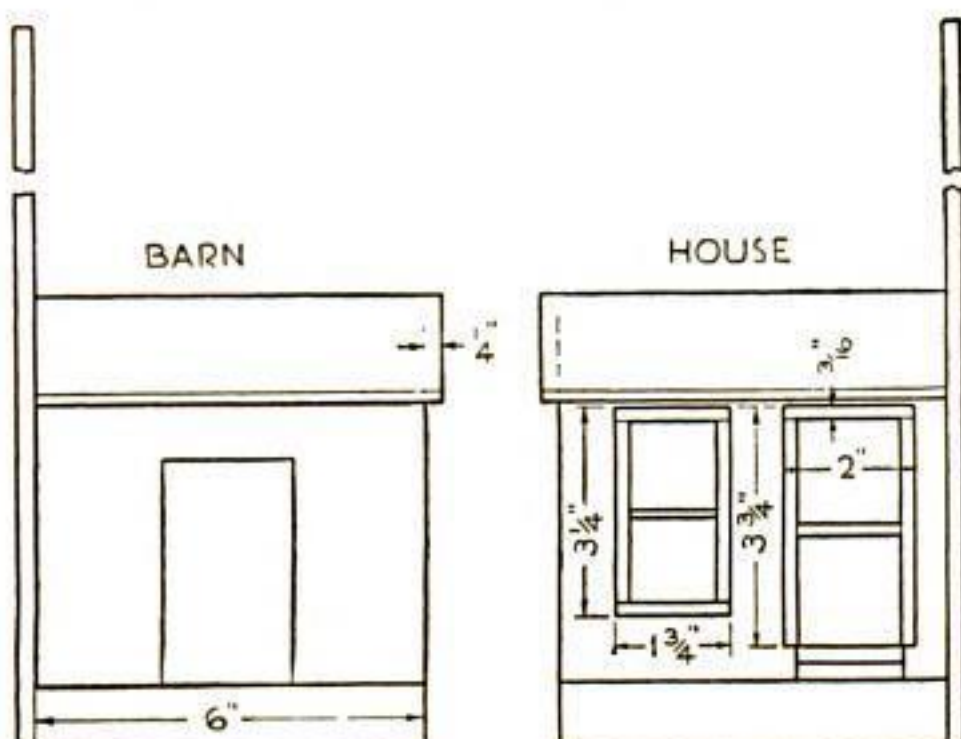
(Continued from page 81)

and windows. The windows may be red to represent lamplight if desired. The grass in the yard is very dark green shading into black. The stepping-stone walk is white with black joints. The dish is ivory with black markings, while the "body" of the dish is black. The



The characters drawn on squares so they can be enlarged to make full-size patterns

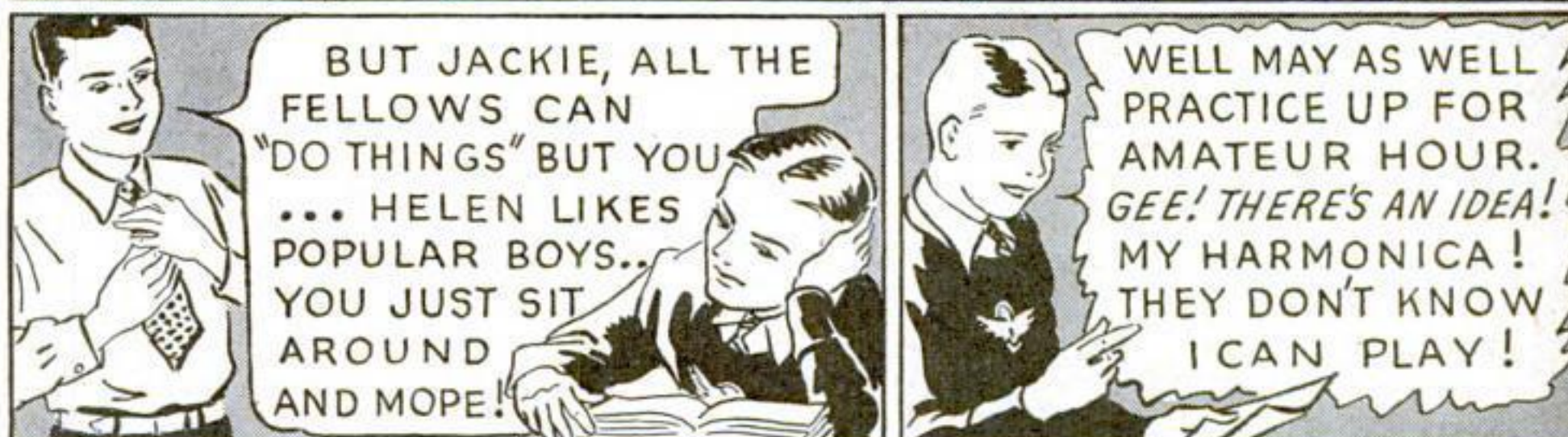
spoon may be silver. The cat is white with black markings, and the fiddle a deep red. Dark shadows are painted in from the eaves down to the ground on a line with the light from the moon, and the top of the house and barn are painted dark green, as is the bottom of the book rack.—D. C. MARSHALL.



The barn and house ends of the book rack

THE HERO OF AMATEUR HOUR

was the "HIT" of Helen's Party, ... and he wasn't even there!



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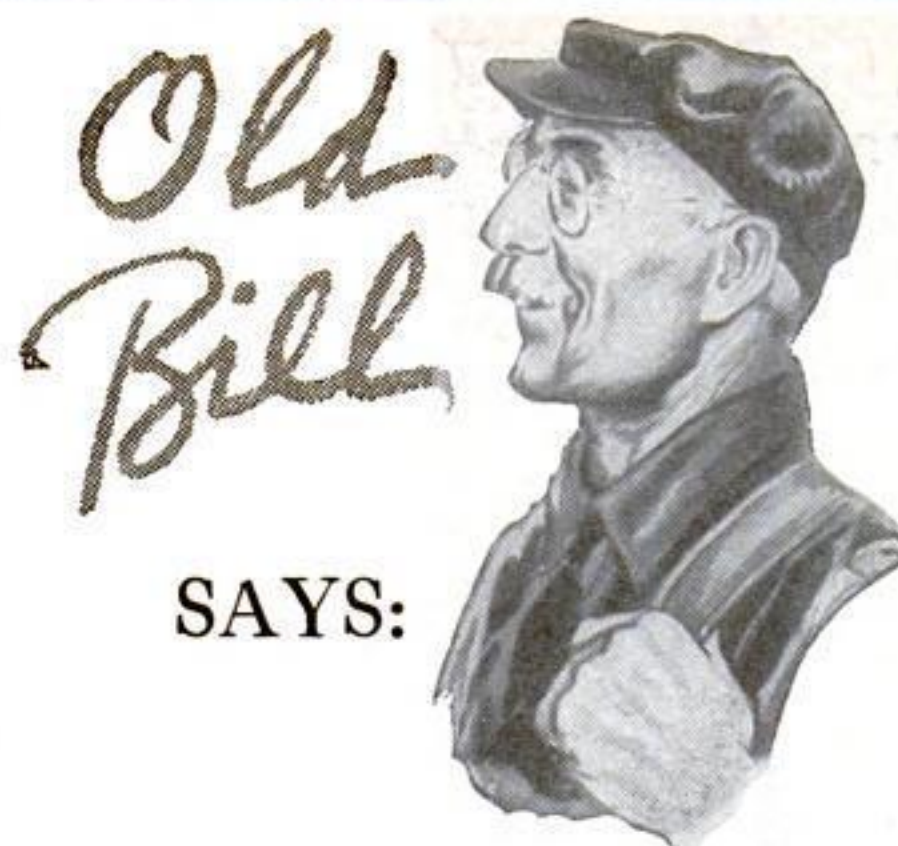
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SAYS:

FOR heating long work, such as mandrels and reamers, in the hardening process, it is best to use the lead pot. Take care to hold the piece vertically while heating and quenching, and it will come out of the bath straighter.

...

Don't forget that a tool-post grinder is the thing to use when it's necessary to get speed with a small milling cutter, whether you use the lathe or the miller.

...

In connection with small and medium punch-and-die work, when steel plates are used for holder and shoe, more accuracy may be had if the parts are squared by grinding and small holes are tapped in the sides at suitable locations so that short parallels can be bolted on. This makes it possible to lay out the buttons in relation to the sides as well as spacing from one to the other. The assembly will then line up much better.

...

If the blades of an inserted-teeth mill have a tendency to move back while using a heavy feed, cut them flush with the opposite side of the blank and fit a ring machined from 1/4-in. stock.

...

It doesn't pay to attempt to true up a hardened gear, sprocket, or similar part for the purpose of grinding the bore unless you have some means of correcting lateral errors. Make an adapter plate to fit the faceplate, with six evenly spaced throw screws.

...

The correct drive for die-shoe posts is 0.0015 in. Don't trust the drawing, but check the actual size of the bores separately.

...

When making a mandrel, use a combination center drill twice the size you would pick out for ordinary work. Don't spare the countersink depth, and don't forget to recess the ends to prevent damaging the centers,

...

Expansion reamers cause plenty of headaches unless they are set in the toolroom. To avoid having them tampered with once they have been set for a job, it is well to coat the adjusting screw with sealing wax.

...

It doesn't make sense to do unnecessary turning and grinding when stock ground accurately to within 0.001 in. is commercially available in almost any required diameter and length.

...

If an end mill is rather long in relation to its diameter, it takes only a slight pressure against the work to spring it a few thousandths. It is advisable to grind the body with at least a 0.002-in. taper towards the back before starting, and then check the measurements.

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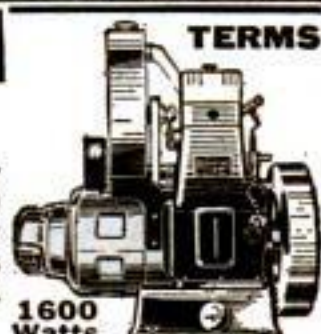
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POPULAR SCIENCE MONTHLY

Balancing a Homemade Trailer Accurately

ONE of the most important and difficult details in designing a trailer is to place the axle in a position that will balance the trailer in such a way as to leave the required weight of from 200 to 250 lb. on the hitch of the towing car. From the many trailers already built, we have learned that the approximate balancing point is just a trifle more than one third from the rear of the body. In other words, a 15-ft. trailer should have the axle placed about 5 ft. 3 in. or 5 ft. 4 in. from the end. Still, the exact position depends on the shape of the body and its interior furnishings.

A sure way of balancing a trailer is to attach the undercarriage only after the entire body is completed. The undercarriage may then be moved to the predetermined position and the body lowered onto the springs. If it does not balance properly, move the undercarriage either forward or backward until you find the correct position. Then bolt the spring hangers in place on the body.
—OTTO KLEIN.

Polishing Scratched Glass

SCRATCHES on glassware may be removed, if not too deep, by using a cloth buffing wheel charged with a very fine grade of emery powder for the roughing process, and jeweler's rouge similarly applied for the final polish. If necessary, the work may be done by hand, in which case the emery and rouge are rubbed on the glassware with a soft rag.—RALPH A. TIEMANN.

Bench for the Laundry

(Continued from page 75)

drilled and bent in a vise to the proper shape. They should be screwed to the stand when all parts are in place. The leg frame or standard is fastened to the top with hinges so that after the stand has been removed from the main bench, it may be folded and set somewhere out of the way.—EDMUND C. HANLEY.

LIST OF MATERIALS

Description	No. Pc.	T.	W.	L.
Sides	2	3/4	6	45
Cleat	1	1 3/4	2 1/2	12
Top	7	3/4	1 3/4	49
Cleats	2	3/4	3 1/2	18
Ends	2	1 3/8	12	26
Legs	2	1 3/4	1 3/4	26
Rail	1	3/4	3 1/2	12 1/2
Rail	1	3/4	2	12 1/2
Cleat	1	1 3/4	2 1/2	20
Cleat	1	3/4	2	20
Top	8	3/4	2	20 1/2
Bolts	2	3/8 dia.		3
Bolt	1	3/8 dia.		2 1/2
Bolts	4	1/4 dia.		2 1/4
Brace (band iron)		1/8	1	46
Braces (band iron)	2 or 4	1/8	1	11
Clamps (band iron)	2	1/8	1	8
Hinges	1 pr.		1 1/2	1 1/2

NOTE: Dimensions are given in inches. The lumber is equivalent to about 2 1/2 board feet.

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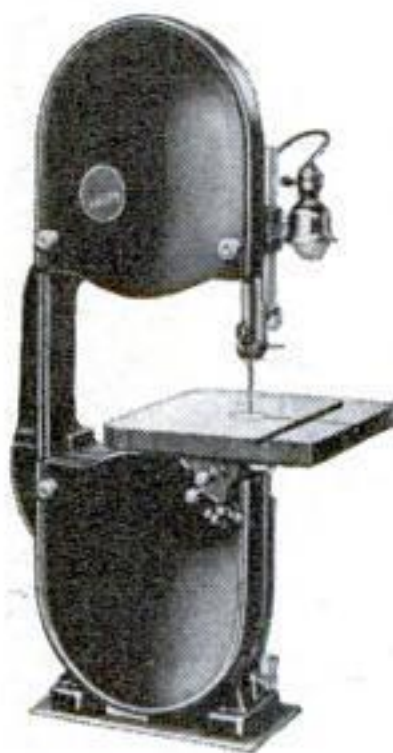
Thoroughly tested by years of the hardest work in industrial shops of all kinds, Delta 14-inch drill presses are still leaders in this field. This year's models are further refined and improved, including the adoption throughout of the new internal-gear clutch inside the spindle pulley, which automatically insures perfect alignment. (Patented.)

Furnished in both bench and floor models, in high and low-speed types and in multi-spindle models, there is a wide choice in these machines for either home-workshop, school, and industrial or production use.



A vital industrial change has occurred in this country during the last ten years. Large production plants, ordinarily associated with only heavy production equipment, have installed batteries of low-priced motor-driven units—thus achieving greater flexibility, and lower costs. Light manufacturing plants, for greater economy and increased efficiency, are utilizing more and more this new type of motor-driven tool. Building contractors and small shop owners have eagerly adopted low-cost motor-driven units to replace slow, costly hand operations. At a fraction of the cost of heavy equipment, schools have installed complete shops of individual, accurate, convenient machine tool units. Home work-shop owners by the tens of thousands have turned to "power tools" to eliminate tedious hand operations—and open new fields to spare-time craftsmanship.

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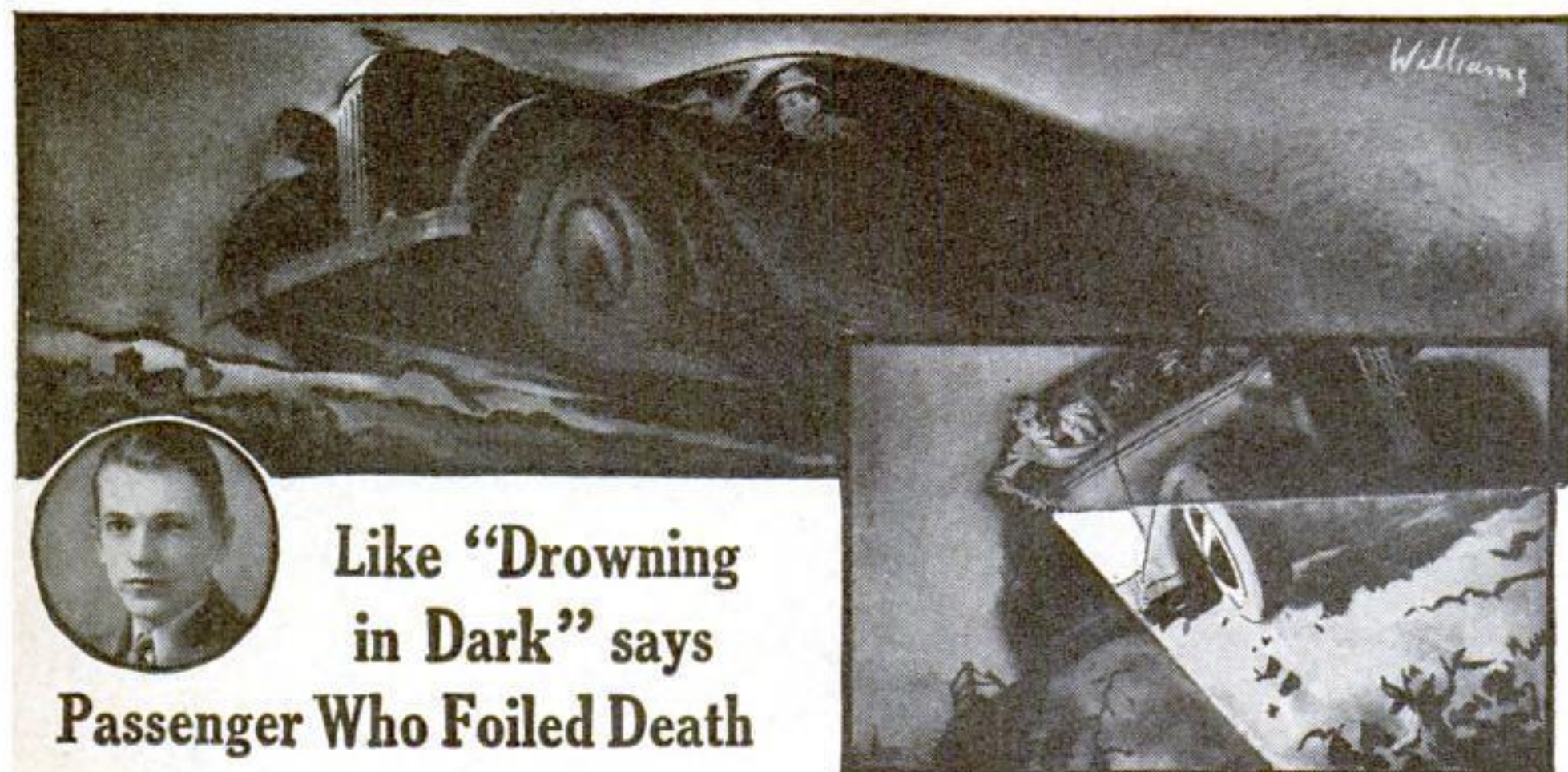
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"I clawed the little door open with my left hand, rolled down the window with my right and shoved the light out and by the guiding beams of those *fresh* DATED 'Eveready' batteries, the car came to a

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Walter Hazen



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Split-Phase Motors

(Continued from page 96)

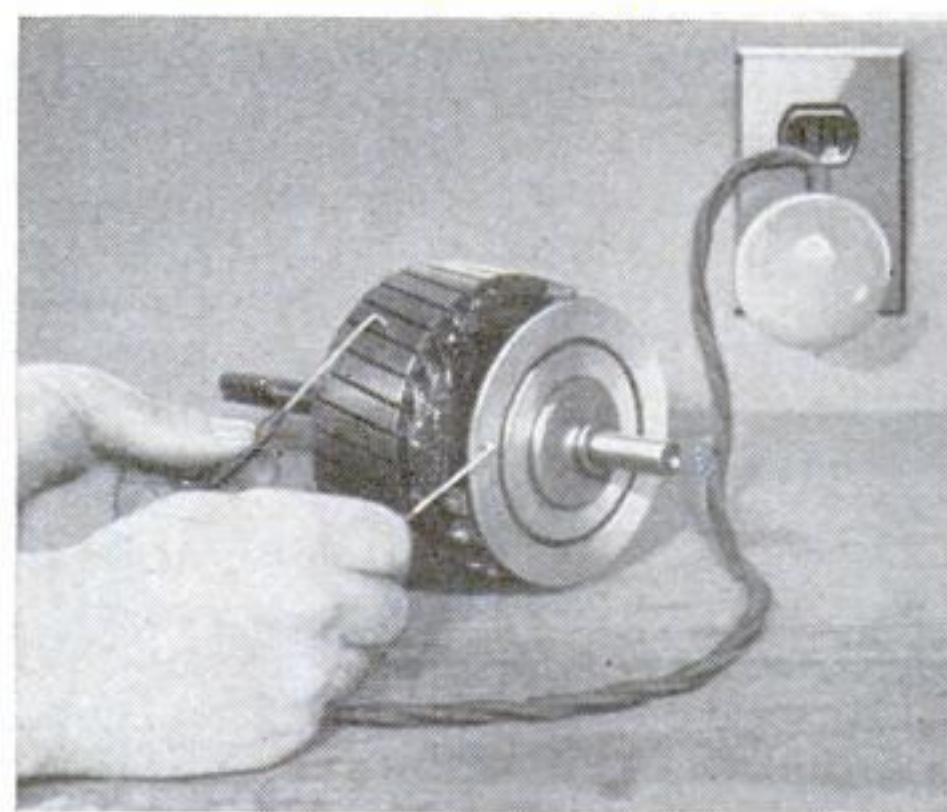


Fig. 4. A ground test for rotor windings

it will eventually become a loose fit on the shaft. This causes a noisy motor, and if it is worn enough, it will allow the rotor to strike the inner surface of the stator. The rotor should be slipped into the bearing housings and the shaft tested for up-and-down play. There should be very little lost motion here. If necessary, new bushings can be pressed into the housings and reamed to a perfect fit for the shaft.

After completing the assembly, it is well to test the shaft again for lost motion and also to see that it turns freely. The bearings in this motor are packed with waste, which is kept soaked by frequent applications of a light grade of good motor oil. When washing the parts as previously suggested, it is advisable to remove this packing first. If it is free of dirt and grit, it may be replaced, but in case of doubt, use new packing of the same grade.

The final step is to replace the brush block. Look over the cord and if it is worn, replace it with a new piece. Check the brush connections.

Another type of split phase motor is shown in Fig. 5. It has been taken apart because it would not start when the current was applied, but when quickly rotated by hand, it would pick up speed and operate. This trouble is usually due, in this type of motor, to the starting-winding switch, although it may be that the starting winding has burned out. In this case it was found that the fingers were badly worn and pitted and there were deep grooves in the rings. The only remedy was to order a new switch.

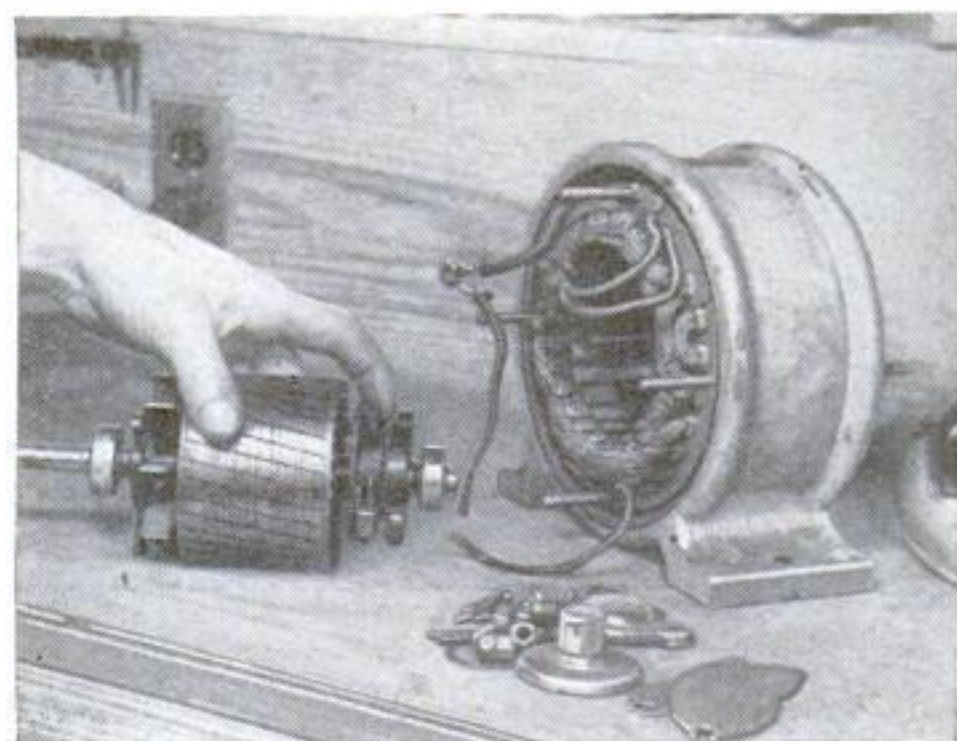
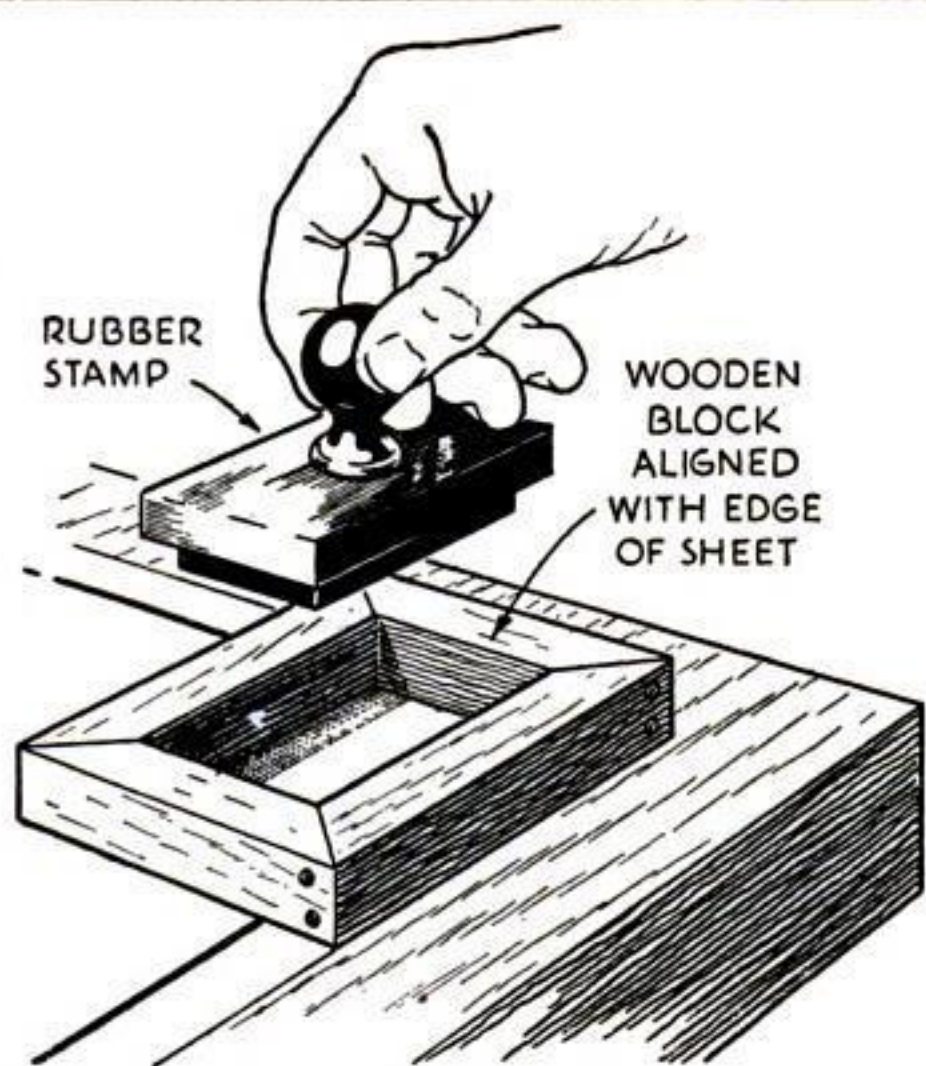


Fig. 5. Another type of split-phase motor

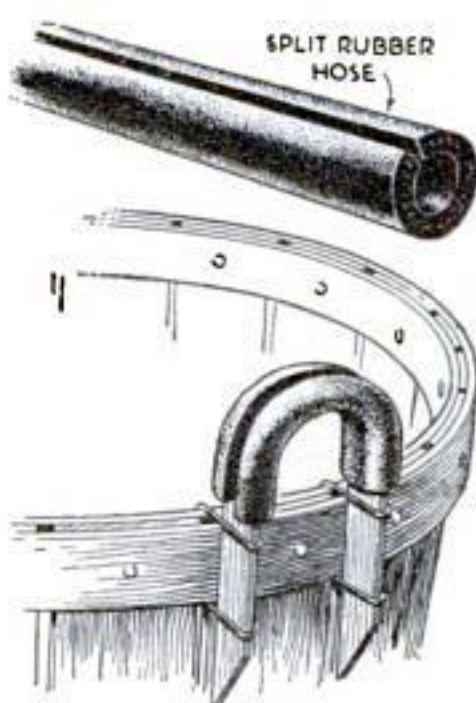


Aligning the Title Stamp on Shop Drawings

WHEN a rubber stamp is used to add a standard title block, notes, or other information to a sheet of shop drawings, considerable care is required to locate it properly with reference to the margin lines. This difficulty may be avoided by means of a "target" or template made as shown above so that when it is aligned with the edges of the sheet, the stamp will be properly placed.

Basket-Handle Grips Made from Old Garden Hose

COMMON bushel baskets are used about the farm or garden for carrying grains, soil, or other heavy commodities, but the sharp edges of the wooden or wire handles cut painfully into one's hands. If pieces of a discarded garden hose are split and slipped over the handles, as indicated, they will provide comfortable grips. If the handles are made of wire, they can first be padded with rags or cord.—G.H.



Heat Aids in Lapping Piston to Fit Cylinder Closely

ON AN especially exacting job of lapping pistons to their cylinders, the following simple and rapid method solved the problem:

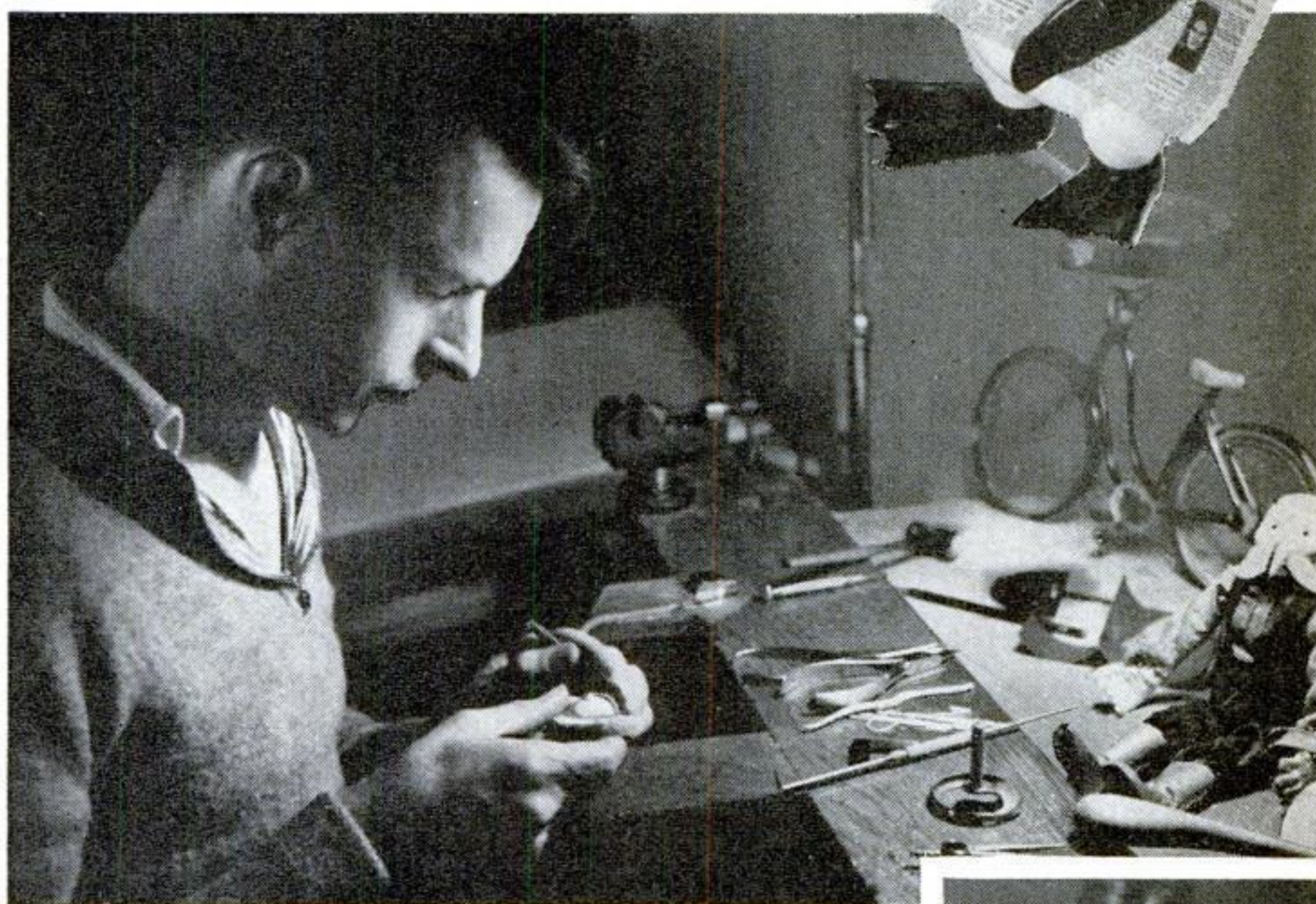
The cylinder was turned about 0.0002 in. undersize and lapped to size by means of a mandrel and grinding compound. The piston was turned about 0.0002 in. larger than the diameter of the lapped cylinder. The cylinder was then immersed in hot water until it expanded enough to admit the piston for the entire length. The piston, coated with fine grinding compound, was inserted and lapped in place, the lapping being continued until the cylinder had cooled.

The method is limited, of course, to work of a size easily manipulated by hand.—RALPH MAYNE.

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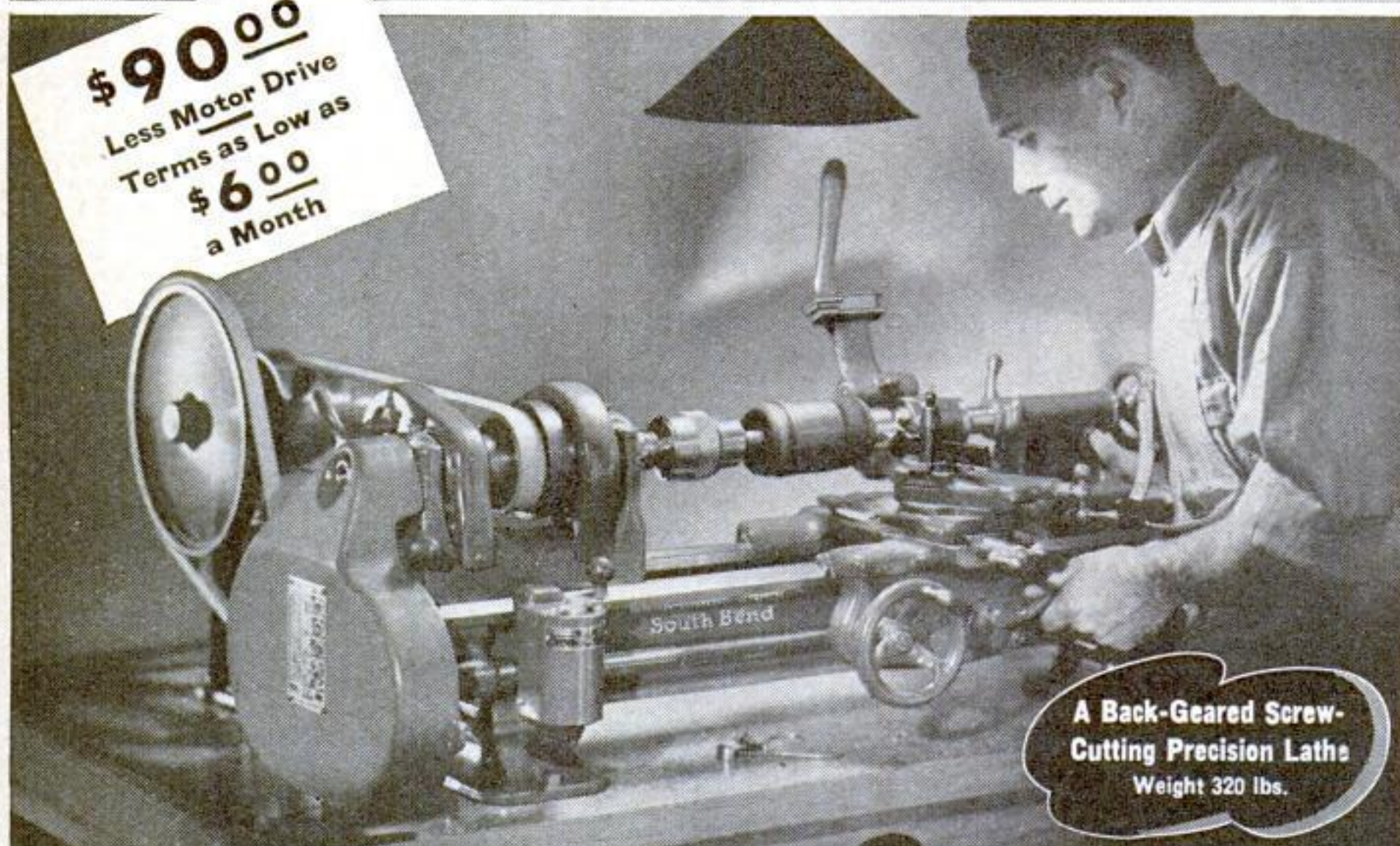
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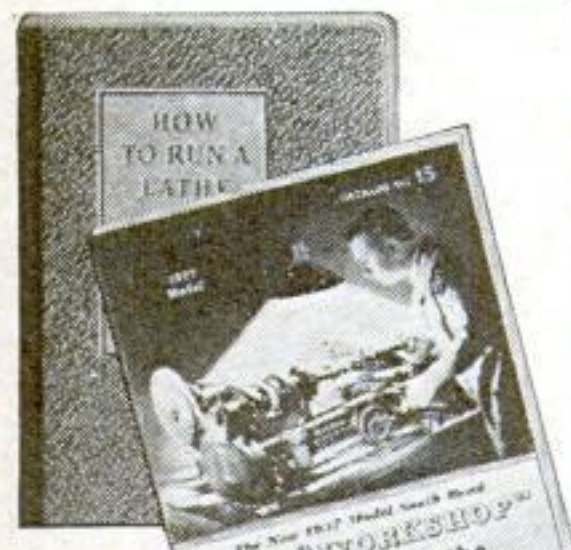
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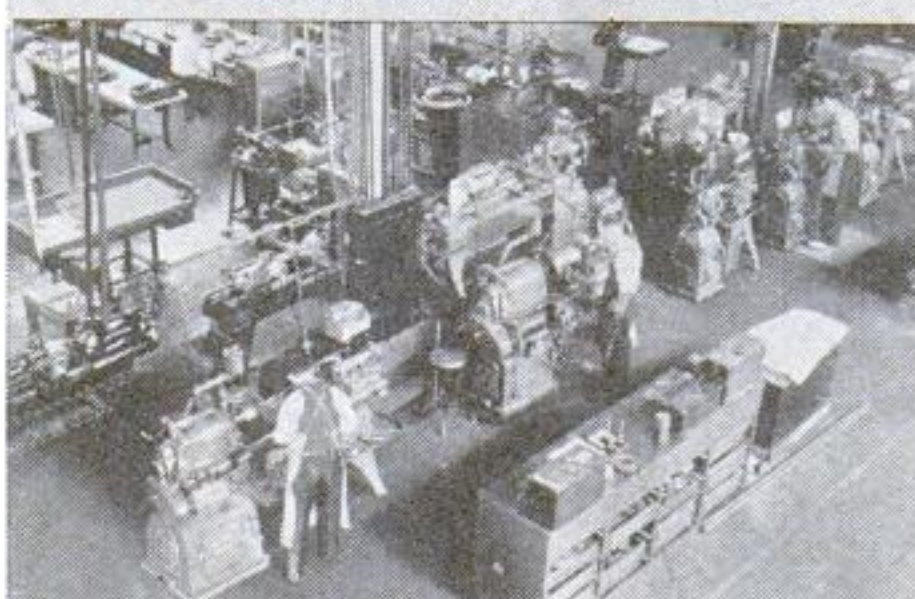
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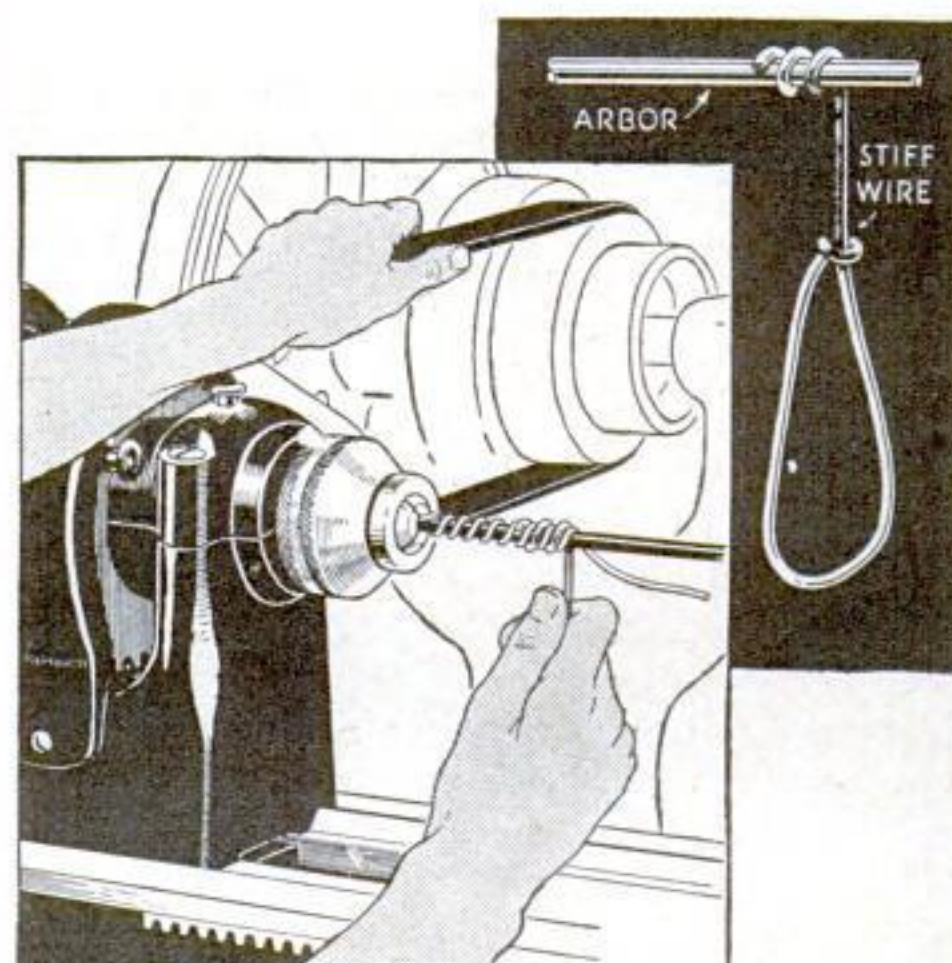
APOLLO: Uses 2 No. 6 dry batteries. 7 1/2 in. tall. Big, sturdy light. Less batteries \$1.95

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Simple Spacing Guide for Winding Springs

COIL springs may be wound quickly and evenly with the aid of a guide made by winding a few turns of stiff wire around an arbor and bending a handle as shown. Wind the guide wire from left to right around the arbor in a direction opposite to the rotation of the arbor.

The rod used as an arbor should be slightly less in diameter than the inside diameter of the finished spring. It may be any length within the capacity of the lathe provided it is well supported at both ends. The starting end may be pushed into the space alongside one of the chuck jaws or passed through a hole drilled through the arbor, in which



Winding a small spring with the aid of the stiff wire guide, which insures even spacing

case the end must be cut off to remove the spring. If the end must be left long, cut a long slot in the chuck end of the arbor to take the end of the wire so the completed spring will slide off the arbor. For springs requiring special bends on the protruding ends, fixtures may be attached to the arbor and provided with simple means for holding and releasing the springs.

For a few short springs, the belt may be pulled by hand, but for a quantity of springs the power may be used and the springs later cut to length. To avoid injury to the hands from the recoil of the spring, always run the arbor several revolutions in reverse before cutting.

Springs may be made without a lathe by bending the end of the rod to form a crank. The rod is then pushed through a snug-fitting hole in a block of wood held in a vise.—EVERETT S. TABER.

Old Wall Paper Removed with Garden Sprayer

IN REMOVING old wall paper it saves work to spray on the water rather than apply it with a brush, rag, or sponge. A portable sprayer such as is used for spraying fruit trees, shrubs, and garden vegetables serves the purpose nicely. This method requires less water, is easier on the person doing the work, and is less likely to damage the woodwork and furniture.—MILTON LAUNER.

Steam Still Rules the Rails

(Continued from page 33)

recently revealed some interesting figures. Of all the world's trains that burn up the rails at sixty miles an hour or more, nineteen and one half percent—say, one out of five—are hauled by Diesels. Twenty-one and a half percent—again, roughly one out of five—are electric trains. All the rest—the remaining sixty percent, three out of five, that constitute the bulk of the speedsters—are hauled by steam.

IF ANYONE imagines that the Iron Horse is going to be outmoded by the Aluminum Horse, his opinion differs from that of many forward-looking railroad executives who are betting their blue chips on steam. Diesel-powered flyers may have stolen a march in setting the pace for high-speed schedules, but there are limits to what a Diesel motor can pull on rails. You can build one powerful enough to drive a ship, but fitting it into a locomotive, where track and tunnel clearances have to be considered, is another matter.

Diesel men have tackled the problem from two directions. They have strung together two and even three carfuls of Diesel motors, to make composite locomotives of 3,600 and 5,400 horsepower under the control of a motorman in the forward cab, and they have substituted cars of lightweight aluminum alloys for standard cars of heavy steel in trains that Diesels will pull.

Yet modern improvements are simultaneously making trains heavier. Air-conditioning alone, for example, adds about three tons of extra weight for every passenger car to be hauled—and some 10,000 cars are now air-conditioned, compared with one lone diner seven years ago. Hence, railroad men are looking with more and more favor at the brute strength of the steam locomotive, which can haul freight-train tonnage at express-train speed.

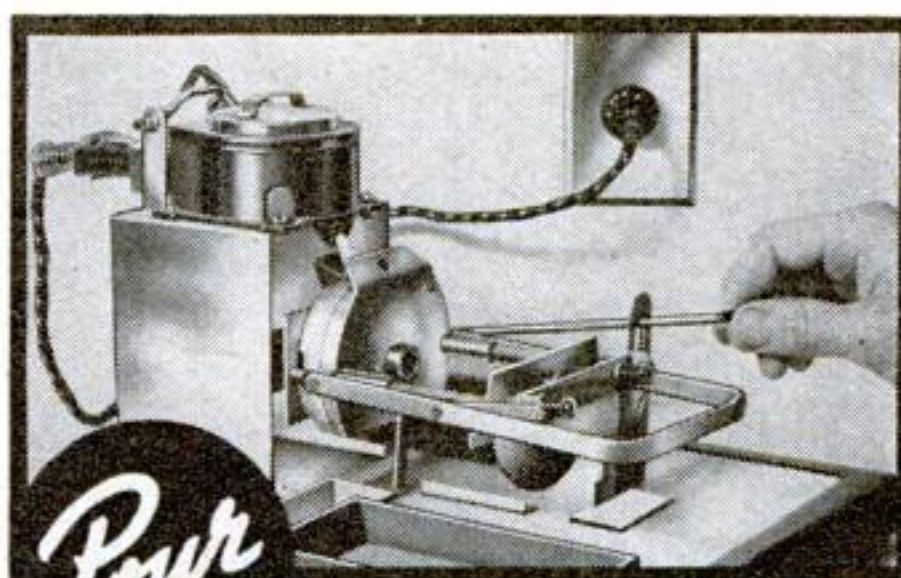
WHAT about electric locomotives, like the 7,000-horsepower monsters that pull the Pennsylvania Railroad's crack New York-Washington trains on some of the fastest schedules in the East, as rivals to steam? There is a good reason, railroad men say, why barely more than one percent of the country's total railway mileage is electrified. Because of its higher cost—electric locomotives, for instance, cost twice as much as steam locomotives—electrification pays its way for high-speed schedules only in densely populated areas where the volume of railroad traffic is particularly heavy. Outside these restricted regions, the steam locomotive remains the speed king of the rails.

Perhaps the best example is to be found in the plans of the Pennsylvania Railroad itself—a leading exponent of electrification, engaged at present in completing the \$250,000,000 project of electrifying its tracks from Philadelphia

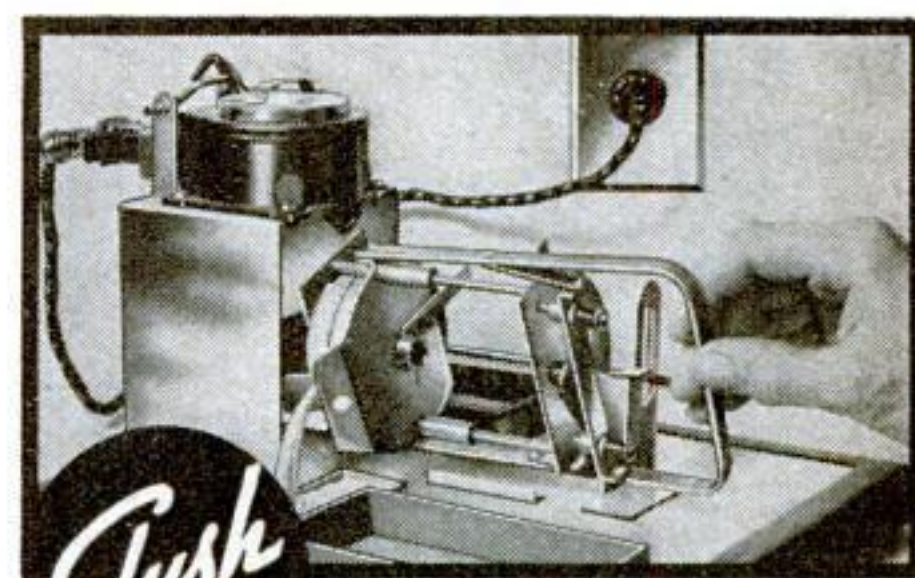
(Continued on page 132)

NEW GILBERT ELECTRIC KASTER KIT

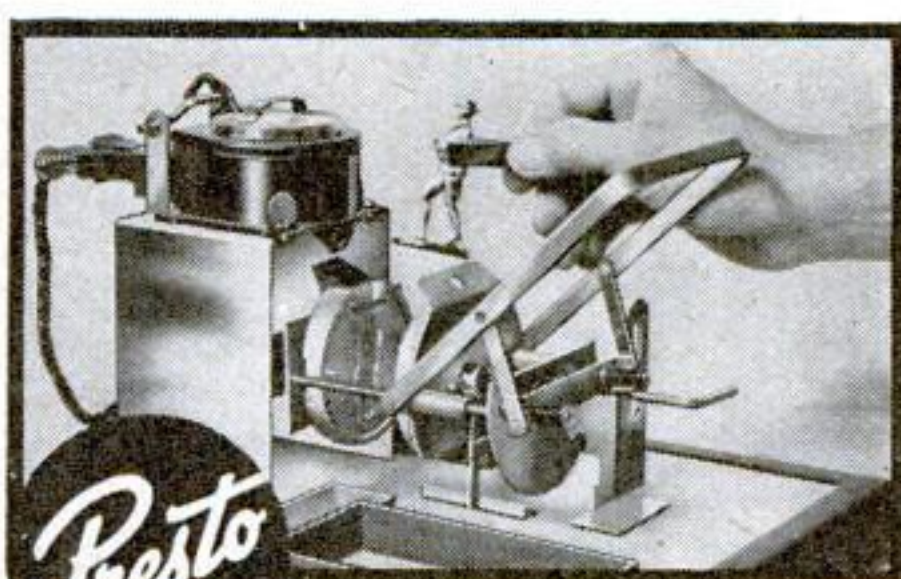
First and only "slush type" Casting Outfit—makes life-like figures with fifty percent less metal



Pour
Lift the lever and molten metal flows into the mold. Developed by the Gilbert Hall of Science, Kaster Kit is automatic. Heats electrically. Safest, easiest, fastest casting outfit you can own.



Slush
A twist of the "metal-saver" lever slushes off excess metal—producing a hollow casting. This revolutionary improvement makes possible fifty percent more figures from the same amount of metal.



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Out pops your soldier—"true mold"—correct proportions—not flat and thin like the ordinary kind. Color soldiers to resemble all the armies of the world.



32 Different Molds

Soldiers, sailors, indians, athletes—these are but a few of the 32 Kaster Kit molds you can get. Set of 4 bandmen, 4 athletes, or 4 military figures, \$2.00 per set.

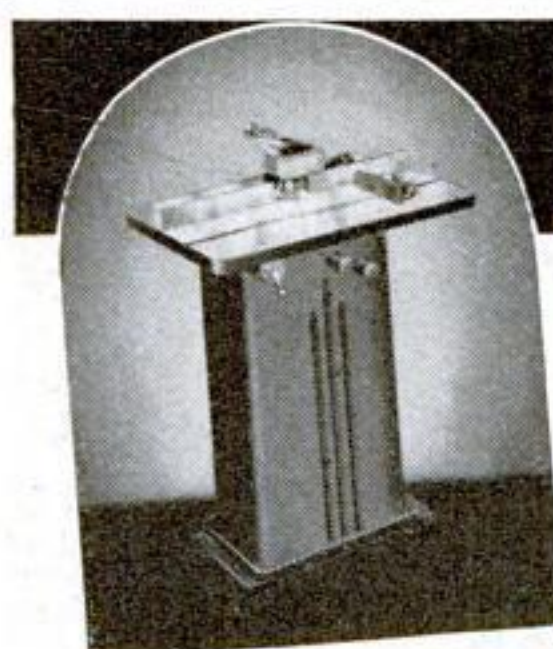
See the new No. 7 Kaster Kit at your nearest toy store. Complete with 1 mold, 24 pigs of metal, tools and 2 paints, \$6.50. Other Gilbert casting outfits from \$1.00.

FREE The Big Kaster Kit Parade—in full colors—shows all 32 Kaster Kit Molds that make realistic soldiers for you.

The A. C. Gilbert Company
111 Erector Square, New Haven, Conn.
Please send me your Kaster Kit Parade—free

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New Shaper

1938 CATALOG NOW READY

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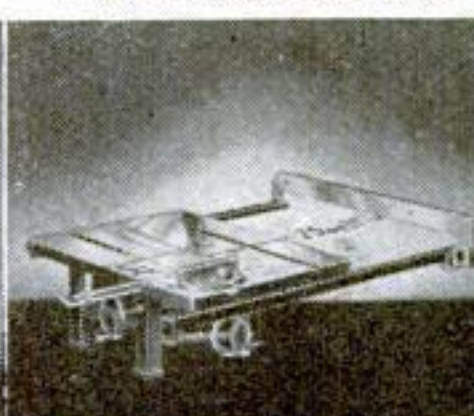
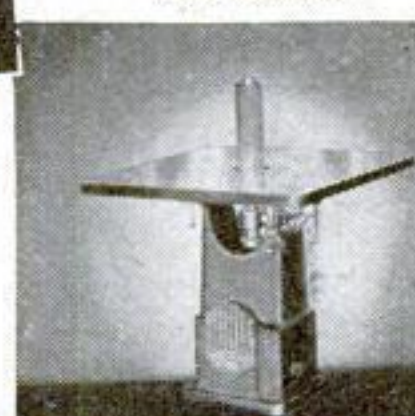
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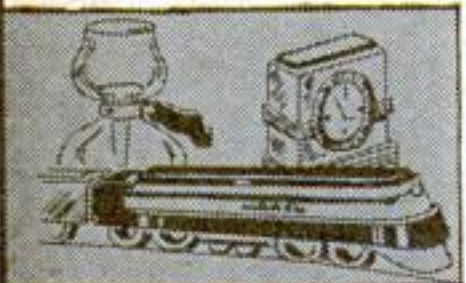
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Rush FREE 1938 Catalog No. 69—9M7

Name

Address

City State

PASTE COUPON ON PENNY POST CARD

Steam Still Rules the Rails

(Continued from page 131)

to Harrisburg, Pa. Now this same railroad announces it is developing steam locomotives equal in performance to its best electric types, for use in non-electric territory. Completely streamline, and using two pairs of cylinders instead of the conventional single pair to turn their eight driving wheels, they will be able to pull heavy passenger trains at 100 miles an hour.

To keep the Iron Horse in first place, designers have adopted methods that would seem strange to an old-timer. At one of the country's leading aeronautical wind tunnels, you may see experimenters testing seven-foot clay models of streamline engines. One by one, the miniature locomotives are suspended over a moving belt in the tunnel. The men regulate the speed of the belt and the velocity of the wind stream to duplicate the actual conditions of a full-sized locomotive speeding across the country. Results show which design will give the greatest saving in horsepower.

THROUGH tests like these, designers are bringing the steam locomotive up to date. And they have found that it has the mettle to match its speed with anything on rails. When some other form of motive power is developed that will do as much, do it as cheaply, and net a greater return on the investment, a speaker recently told the mechanical division of the Association of American Railroads, that form of motive power will supplant steam—but it has not yet even appeared upon the horizon. And perhaps that is just as well for the lovers of the Iron Horse, with its belching steam and its thundering drivers, and its ultra-modern dress only enhancing the glamour that has grown up about it of old.

POPULAR SCIENCE Question Bee

HERE are the correct answers to the questions on page 68. Check the letters alongside the numbers with the ones you marked on the test page. Add up your score, giving yourself four points for each one you had right. A total score of eighty to ninety-two is good, and from ninety-two to 100 is excellent.

QUESTIONS

- | | | | | |
|------|-------|-------|-------|-------|
| 1. c | 6. b | 11. b | 16. a | 21. c |
| 2. c | 7. b | 12. d | 17. c | 22. c |
| 3. b | 8. c | 13. a | 18. b | 23. b |
| 4. b | 9. b | 14. b | 19. c | 24. d |
| 5. c | 10. c | 15. b | 20. c | 25. c |

PICTURES

- | | |
|------------------|---------------------|
| 1. test tube | 5. condenser |
| 2. Bunsen burner | 6. evaporating dish |
| 3. retort | 7. graduate |
| 4. crucible | 8. flask |
| 9. beaker | |



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Name.....
Address.....

Dog-Sled Express Serves Snow-Bound Sierras

(Continued from page 43)

in the space of three and a half hours.

There the burned man's partner had prepared him for the trip out. Swathed in bearskin robes, he was laid gently upon the sled, and with infinite caution Tex steered the dog team down the trail. It took two days of careful maneuvering—and faithful teamwork on the part of the dogs—to deliver the patient safely to doctors waiting at the highway.

WATCHING Tex's huskies as they trot smoothly in harness, obedient to every command, it is hard to realize that every one of them is at least part wolf. But notice some of the half-breed females, with their great, curved, ripping fangs, peculiar to the wolf tribe, and you'll see unmistakable signs of wild blood. Then there are the big Greenland Malemutes, huge muscular brutes weighing more than 100 pounds each and measuring as much as forty-three inches around the barrel, or chest. Powerful, with marvelous qualities of endurance, these dogs make the best freighters. Their giant paws, with web-like membranes between the toes extending nearly halfway to the nail, act like snowshoes to give support on the softest snow. Their usual gait with a loaded sled is about six miles an hour over ordinary trails.

When a puppy reaches the age of nine months, his formal instruction begins. Out on the trail, in harness with experienced dogs, he learns to obey Cushion's shouted commands, emphasized by pistol-like cracks of the thirty-foot whip lash. Incidentally, this whip is used almost exclusively for noise-making purposes. If a dog needs correction, the butt of the whip is utilized—never the lash.

When he has mastered the fundamentals of sled-dog behavior, the neophyte receives, by way of diploma, a set of bells fastened to his harness. The dogs seem to sense the meaning of this mark of achievement, and often one will refuse to work without the bells. This leads to complications, for Tex spends much of his time during the winters in patrolling Government and privately owned property. In this work he uses a racing sled and his fastest dogs, and—for obvious reasons—carries no bells.

IN THE course of his training, a dog's special abilities come to light, and Tex places him accordingly. Most people believe the lead dog carries the greatest responsibility, but Tex says equal praise should go to the "wheelers" next to the heavy sled. These dogs, working in their miniature horse collars, must be large, strong, and dependable. Their position exposes them to the greatest danger of injury, and calls for strict obedience to the commands of the driver.

When I visited Cushion's headquarters recently, a few puppies sired by a

(Continued on page 134)

MORE HEAT—FASTER

Guaranteed With This Amazing New CAR HEATER

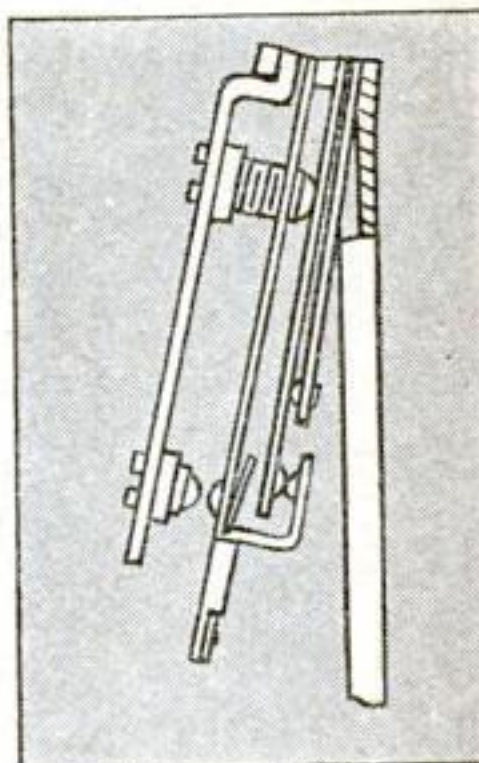
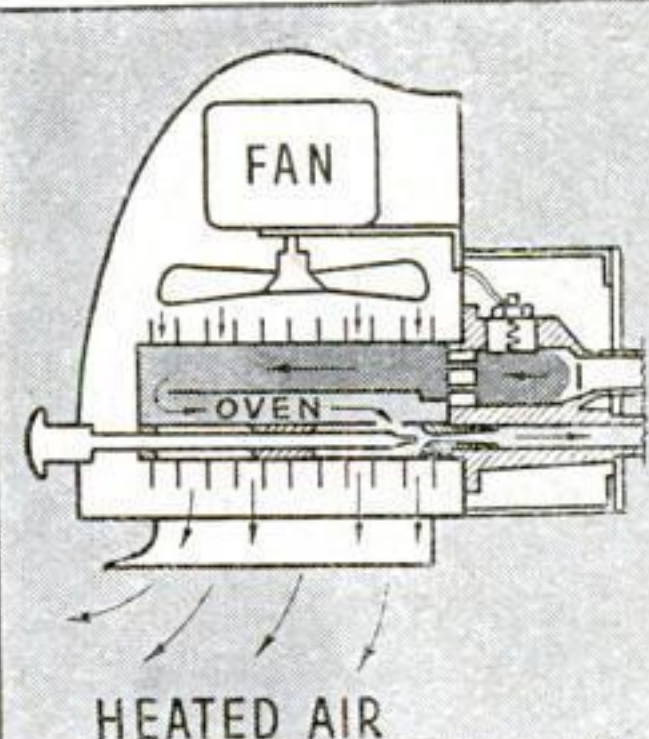


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Operation is simple. A single knob turns the heater on and off, and regulates temperature. An electric igniter lights the heater, then shuts off automatically so there's no heavy drain on your battery. And installation is equally simple—with no hose cutting,

BURNS GASOLINE In Patented Sealed Metal Chamber —Heats Hot in 90 Seconds



Vacuum from manifold draws gasoline into sealed metal combustion chamber—draws hot gases through finned radiating labyrinth—then pulls them out through engine manifold. No fumes can escape into the car.

Thermo-switch—the South Wind's electric brain—turns on the electric igniter—turns it off after the heater is lighted—and waits until the fins are hot before starting the fan which forces warm air thru the car.

no thermostats to buy, no tampering with the cooling system.

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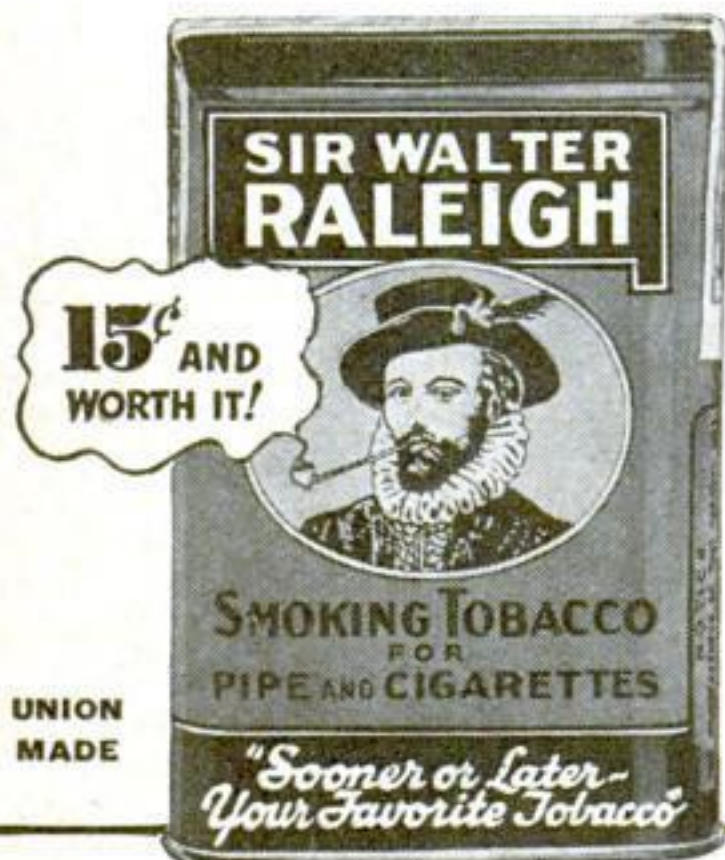


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HOW TO TAKE CARE of YOUR PIPE

TUNE IN Tommy Dorsey and his Famous Orchestra NBC Blue Network, every Friday 9:30 P. M., E. S. T.

Dog-Sled Express Serves Snow-Bound Sierras

(Continued from page 133)

dog from the Byrd Antarctic Expedition were taking their primary lessons in table etiquette. Mealtime comes only once a day, and when Tex opened the doors of the kennel, I was prepared to witness a bedlam of wolfish enthusiasm. To my astonishment, there was no uproar, no clamor of yelping, hungry animals. As the powerful huskies came bounding out into the fenced enclosure, they separated, and each trotted over to a feeding post, where he stood or sat quietly awaiting his turn. To prove the thorough discipline of his huskies, Tex showed that he could take a chunk of raw meat from any animal's mouth without provoking a single growl.

"They never have an opportunity to fight over their food," Tex explained. "Each dog has his own feeding post, assigned to him individually, and habit teaches him always to go there for his meal. Just one blast of the whistle quiets any disturbance."

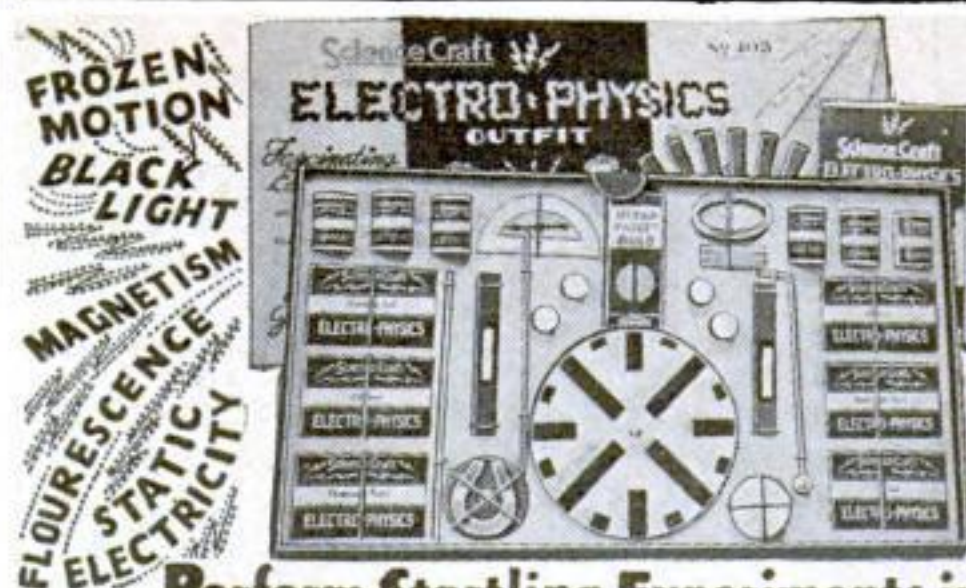
THE board bill for twenty-six husky dogs runs into impressive figures. In summer they are fed beef from the chopping block, as fresh as what you buy for your own table, at the rate of about 700 pounds a week. During the working season, they eat horse meat, which does not hurt their wind as does the beef.

Most of his equipment Tex has had to design to suit his own needs—not only the harness, but also the sturdy freight sled, with its wide steel runners, built to carry a ton or more; the light racing sled, used in patrol work; and the rocker type, used for rescue work because of its curved runners, which smooth up the undulations of the trail. Lately he designed one of an aluminum alloy, in which dead weight is reduced to a minimum. It was built by an airplane company.

Despite the freezing temperatures of Sierra winters, Tex dresses lightly on the trail. In extreme weather he wears a waterproof frock of caribou hide, extending well below his waist. Over his head he draws a parka, or hood, made of wolverine fur, which is the only pelt that will not collect rain, snow, ice, or frost.

HIS wrists are protected by bands of wolf skin which, like the parka, can be tied snugly with draw strings, allowing no bare skin to be exposed to the weather. His storm goggles have shields of steel, with fine hair-line slits cut diagonally at the optically correct angle, allowing almost unimpaired vision except downward close at his feet, and enabling him to face the most violent storm with no discomfort to his eyes.

Because of the wolf strain, all of the huskies work best at night. "My dogs are never so happy as when on a good, fast trail under a bright Sierra moon," said Tex. "—Nor I, either," he added.



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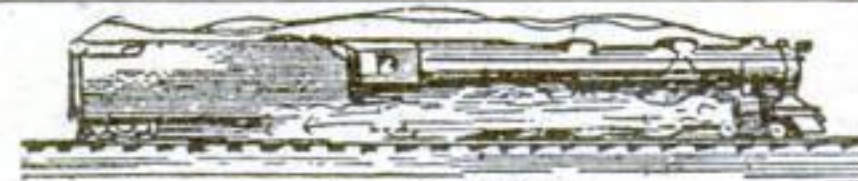
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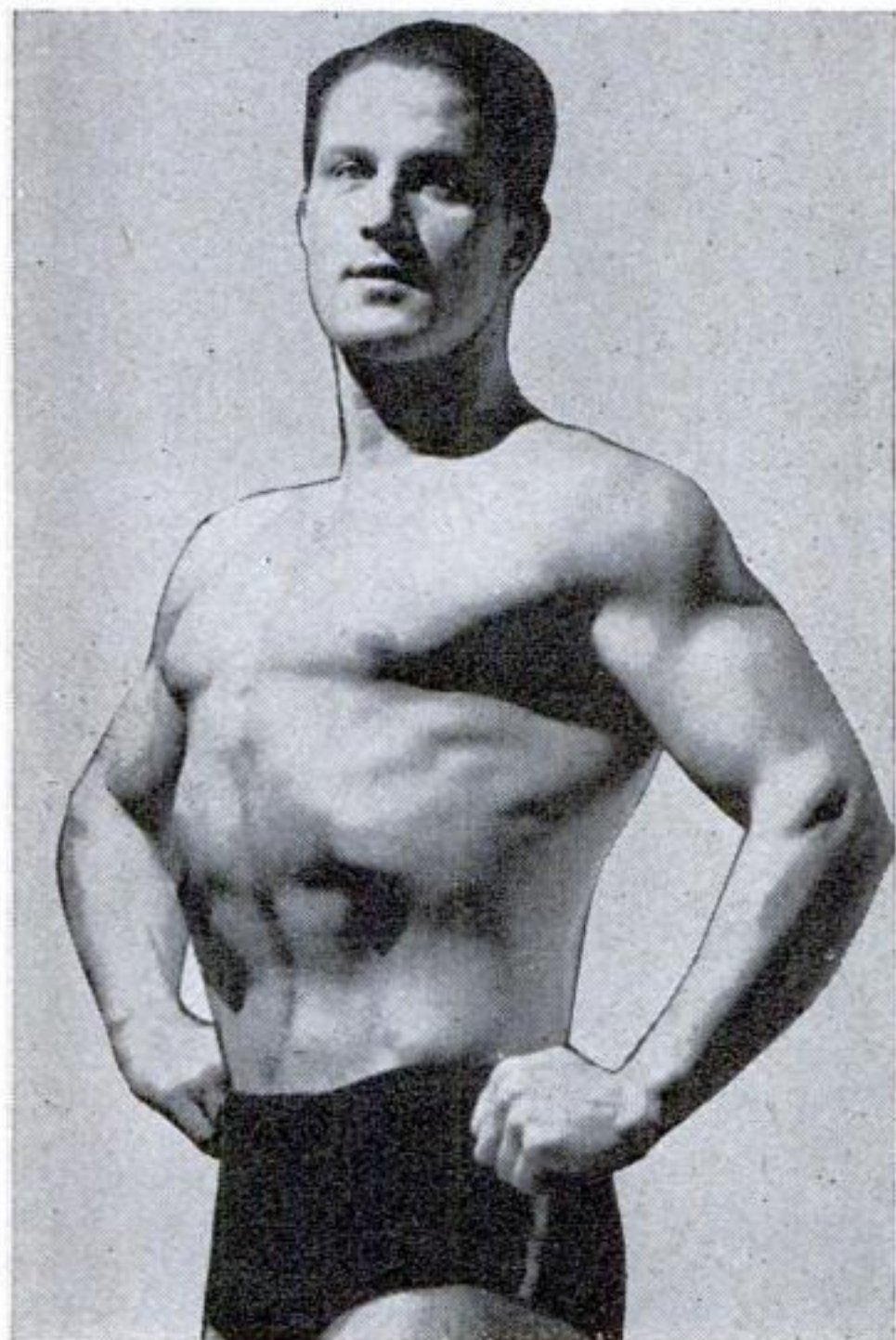
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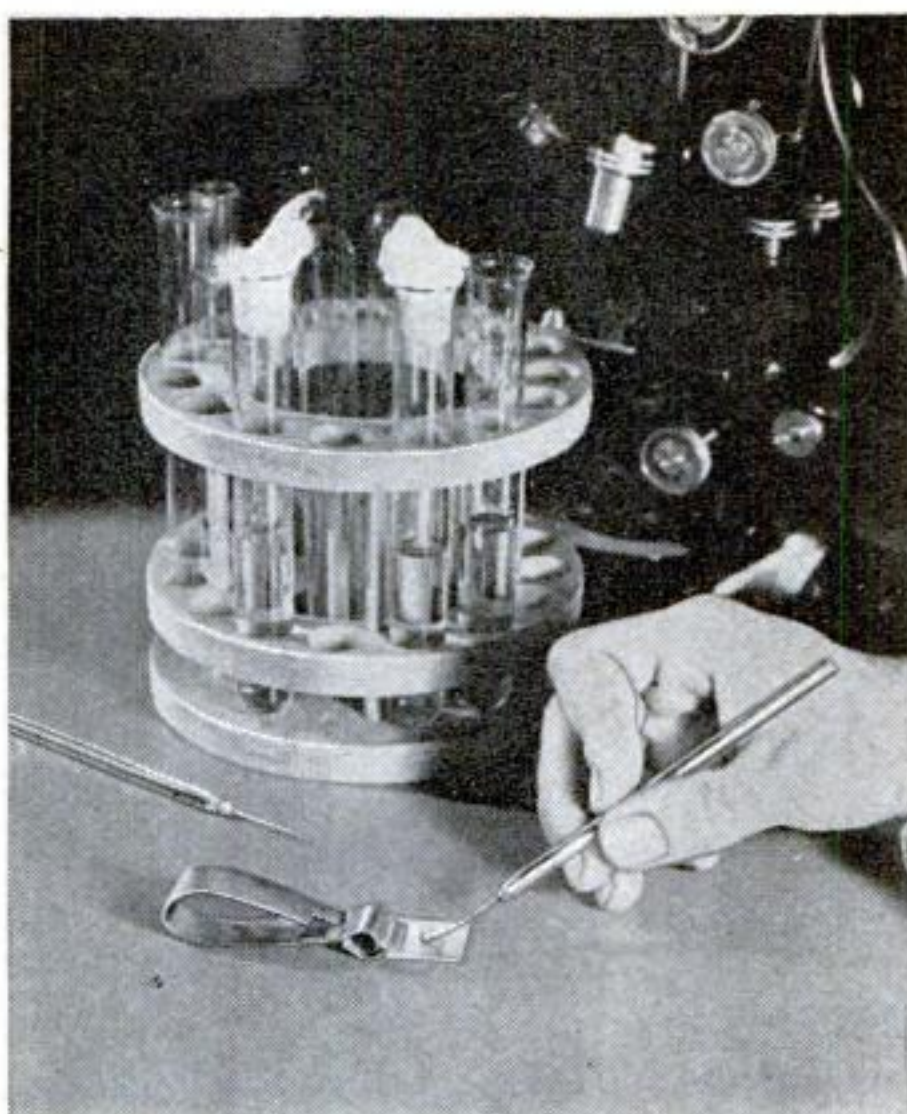
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How the specimen liquid is transferred to the slide with a handy glass-handled loop of wire

Looking at Bacteria with Your Microscope

(Continued from page 101)

passage, for a cover glass, should require about a half a second, with intervals of a second or so between. For thicker supports such as slides, allow more time in the flame. The glass should be heated until it is definitely uncomfortable to touch, yet the specimen should not be charred.

A second method of fixing is with flaming alcohol. After the film has dried, support the slide or cover glass horizontally, and place one or two drops of ethyl alcohol on the preparation. Immediately touch a match to the alcohol, and allow the alcohol to burn away completely. When cool, the preparation is ready for staining. Still another fixing method is to drop the alcohol on the preparation, and let it remain for a minute or so, or until it evaporates. It is a good idea to try all three of these fixing processes, for the final appearance of the stained specimen is influenced somewhat by the fixing.

YOU are now ready to stain the bacteria. Gentian violet, methylene blue, or fuchsine, will serve for the amateur just venturing into bacteriology. The preparation and use of these and other stains were described in a previous article of this series (P.S.M., Mar. '37, page 70). Make stock solutions by dissolving each of the dyes to saturation in ninety-five-percent ethyl alcohol.

The preparation is now ready for observation, unless you want to add a cover glass, in which case you simply place a drop of balsam, petroleum jelly, or other medium on the slide and set the cover in place. Use a very thin cover glass if you intend to observe through an oil-immersion lens. Many workers keep their slides on file without cover glasses. The films are durable enough to last for years, although they

(Continued on page 136)

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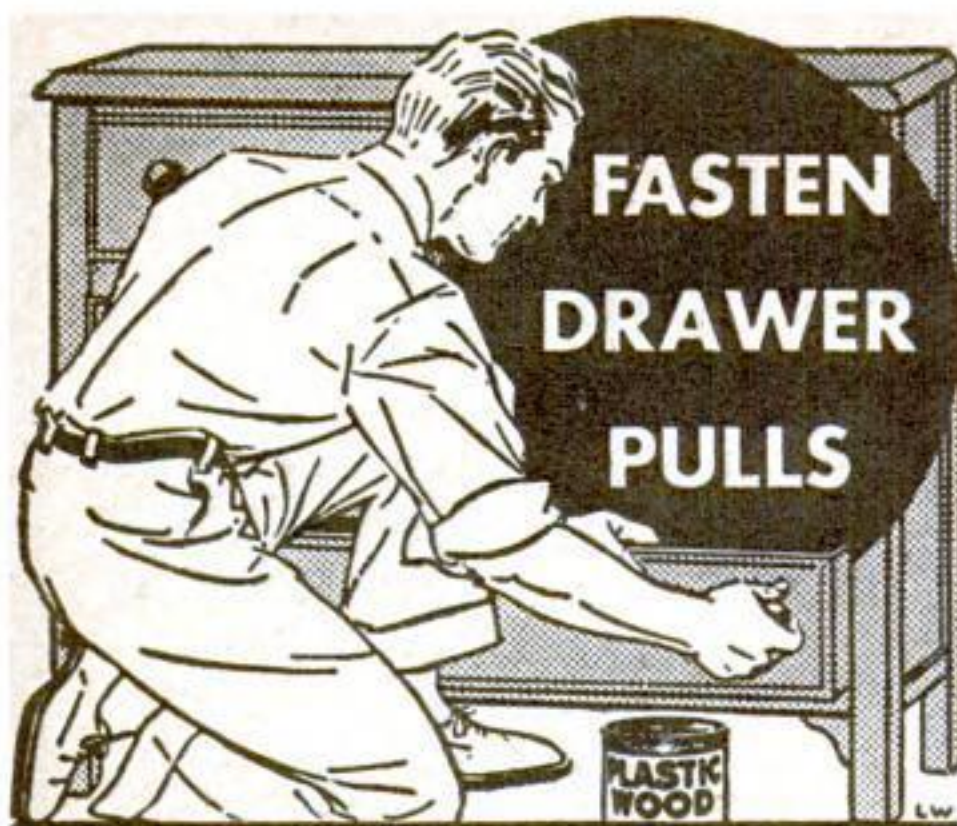
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Old English CEMENTS

Looking at Bacteria with Your Microscope

(Continued from page 135)

do collect dust more readily than when covered. For observation through "dry" objectives which are corrected for cover-glass thickness, as are the professional-type instrument lenses, it is advisable to use cover glasses over slides. When oil-immersion lenses are employed, it makes no difference in the optical performance whether a cover glass is present or not. The same probably holds true of most amateur-type microscopes where no correction has been made for cover glasses.

THE foregoing is the general routine of preparing slides of bacteria. However, there are occasions when additional treatment is required, for example, in making slides of buttermilk, sweet milk, and other fat-containing materials. Thus, in the preparation of milk slides, smear milk or cream thinly on a slide and dry by gentle heating. Fat is then removed by immersion of the slide in xylol for about three minutes. Remove the slide and let the xylol evaporate. Then immerse in absolute alcohol for about five minutes, or until the milkiness has disappeared. After staining for two minutes in Loeffler's methylene blue, wash in water and remove stain with alcohol until only a light blue remains. Mount, preferably in glycerine or petroleum jelly.

If you have a microscope well enough corrected to see living bacteria, you will want to try the hanging-drop arrangement. Obtain a hollow-ground slide—one having a depression ground or molded in the center; a clean cover glass, and some petroleum jelly. Smear a thin film of the jelly around the rim of the depression in the slide. Place a tiny drop or two of the liquid containing the bacteria on one side of the cover glass. A wire with a small loop on one end, and held in a convenient handle, is handy for this. Invert the cover glass so that the droplets hang down, and lower it over the hollow in the slide. The jelly seals the edges and prevents evaporation of the drops. Focus carefully on the drops, with the substage diaphragm reduced to a very small diameter, being careful not to break the cover glass by too much downward pressure if using a short-focus objective. In this way you can observe live bacteria from your mouth and other sources.

BACTERIA are divided for convenience of study into three groups, the rod-shaped bacilli, ball-like cocci, and the corkscrewlike spirilla. (Single ones are called bacillus, coccus, and spirillum, respectively.) Each of these groups is subdivided according to various characteristics of its members. Thus, bacteria with tails are called flagellated bacilli, or flagellated spirilla. Groupings are made according to the number and position of the flagella,

(Continued on page 137)

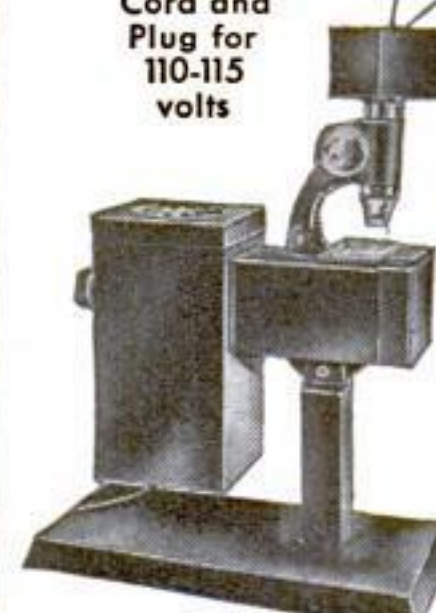
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Looking at Bacteria with Your Microscope

(Continued from page 136)

and according to the way the individuals arrange themselves.

There are several ways of improving the performance of microscopes, particularly the amateur variety, so that they will produce sharper images of such things as stained bacteria. These will be summarized briefly, but detailed directions for altering a particular kind of microscope will not be given because of the variety of microscope designs. The ingenious amateur can easily work out his own problems.

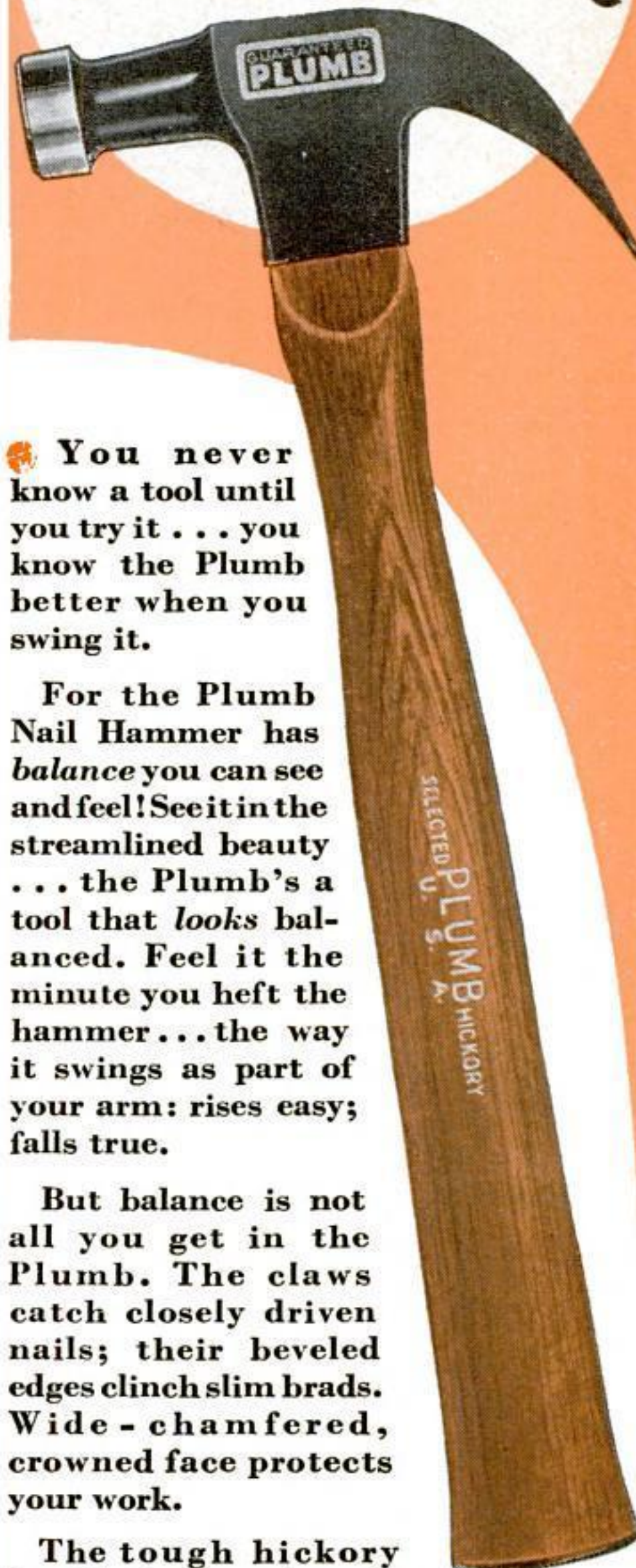
LACK of sharpness in microscope lenses results from the fact that all colors of light are not brought to focus at the same place. This is particularly true of low-cost lenses, for to make the colors behave requires lenses of high correction and consequent high cost. The easiest way to cancel color aberrations is to eliminate some of the colors, leaving one that the lenses focus sharply. This is done simply by placing a color screen or filter somewhere in the light beam. A piece of colored glass, gelatin, cellulose film, or liquid in a glass container, will do. For most microscopes, green or yellow is best. The use of a color filter with stained specimens has the added advantage of increasing their contrast. Thus a red filter used with blue-stained bacteria will make them appear blacker. Because you cancel the effect of some of the light when you use a color filter, it is necessary to increase the intensity of illumination.

Manufacturers of amateur microscopes usually omit substage diaphragms that would enable users to control the diameter of the beam of light reflected from the mirror. With a diaphragm, the beam can be cut down until it increases the contrast of the image and improves the depth of focus. You can improvise a substage diaphragm by fastening a small iris diaphragm, such as one taken from a camera shutter, below the hole in the microscope stage, or by inserting a piece of sheet metal with a hole in it. It generally is not difficult to rig up a simple holder so that metal slides having holes of different diameters can be inserted in turn until the best hole size is found. Still another arrangement is a rotatable disk with openings of varying size spaced around the center.

IMPROVISING a substage condenser is more difficult than either of the two improvements already described. However, you might try inserting a short-focus plano-convex lens, flat side upmost, beneath the hole in the microscope stage. Bullseye lenses from some types of flash lights will do. Experiment with different spacings between the lens and the slide. If you use both a substage diaphragm and condenser lens, place the diaphragm beneath the lens.

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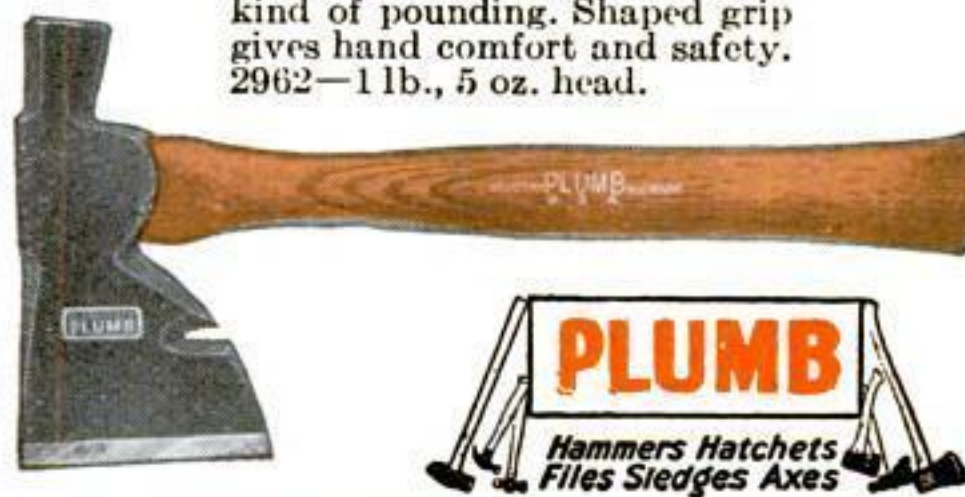
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Flash Synchronizer

(Continued from page 121)

The reflector may be a parabolic type such as is used on the familiar limber-necked desk lamp.

A test light may be made by boring out the top of an ordinary screw plug and mounting a small flash-light socket in the hole. After the connections are made, the hole surrounding the socket should be filled with sealing wax.

The synchronizer is adjusted in a darkened room. Take the back off the camera and set the shutter at 1/25. With the test light in place and the cable release attached to the switch, hold the synchronizer so the test light is in front of the lens. The adjustment screw is backed out so the shutter will operate ahead of the flash. The screw is gradually turned in until the flash of the test bulb is seen through the shutter; then the lock nut is tightened.

The small-size flash bulbs should be used with a shutter speed of 1/25 as they are not designed to fire on close time limits. For better lighting of flash portraits, an extension cord about 4 ft. long should be used so the bulb and reflector may be held at arm's length to one side.—R. L. ASBURY.

Whistling Teakettle Used as Photo Lamp

A HANDY photo light may be made from an ordinary whistling teakettle. A No. 1 photoflood bulb centers exactly in the reflector, and for that reason the illumination is surprisingly uniform and may be used to advantage for photographing large objects and interiors. To obtain uniform lighting over a large area, the light is simply moved about so that the entire area is flooded during a time exposure. The light is also useful around the house and in the garage, in which case the photoflood is replaced with a 60-watt bulb. It will serve for photoflash bulbs, too, the switch being used to operate the flash.

Remove the whistling cap and saw the spout close to the kettle proper. With a sharp pocketknife, scratch a deep groove all around the bottom of the kettle close to the rim. Continue

(Continued on page 139)



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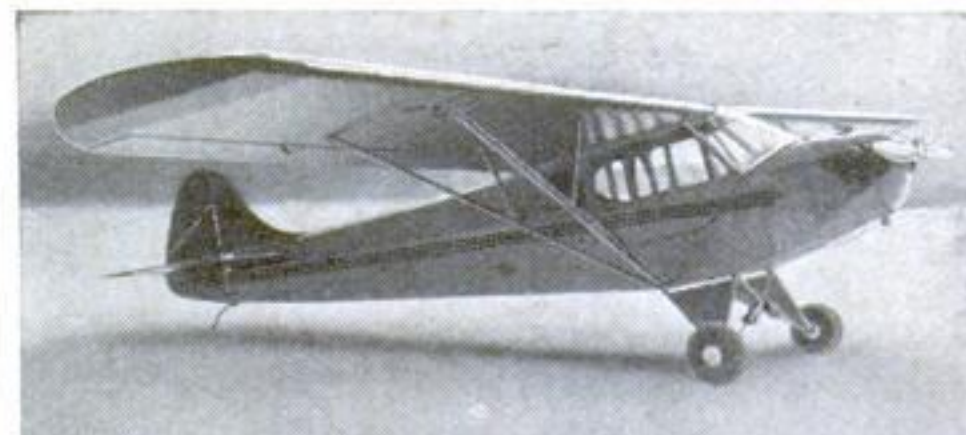
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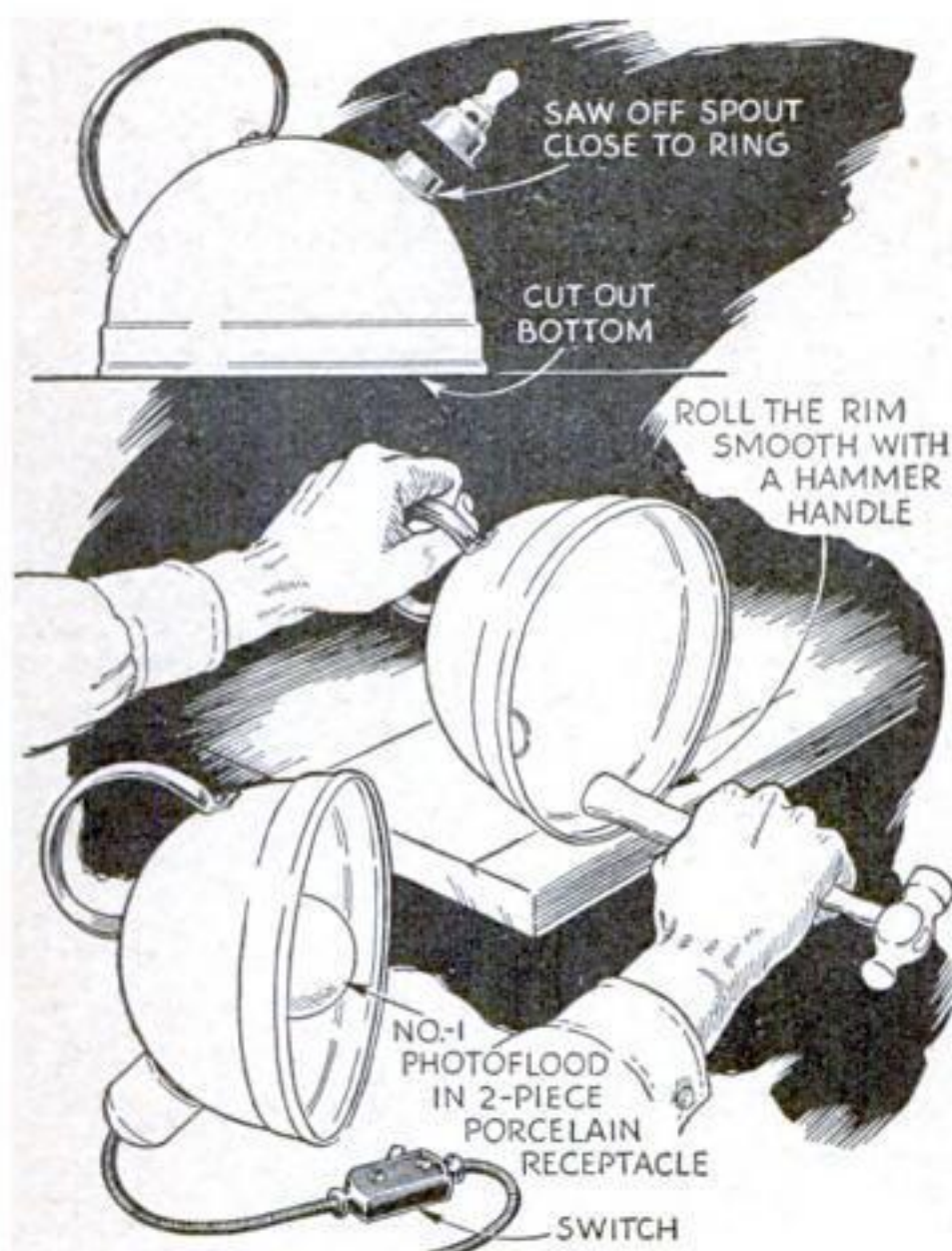
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Teakettle Photo Lamp

(Continued from page 138)

cutting until the groove is nearly through the metal, and push the bottom disk into the kettle. This is much better than attempting to use a can opener. The bottom is now lifted out, and the edge of the rim is rolled smooth.

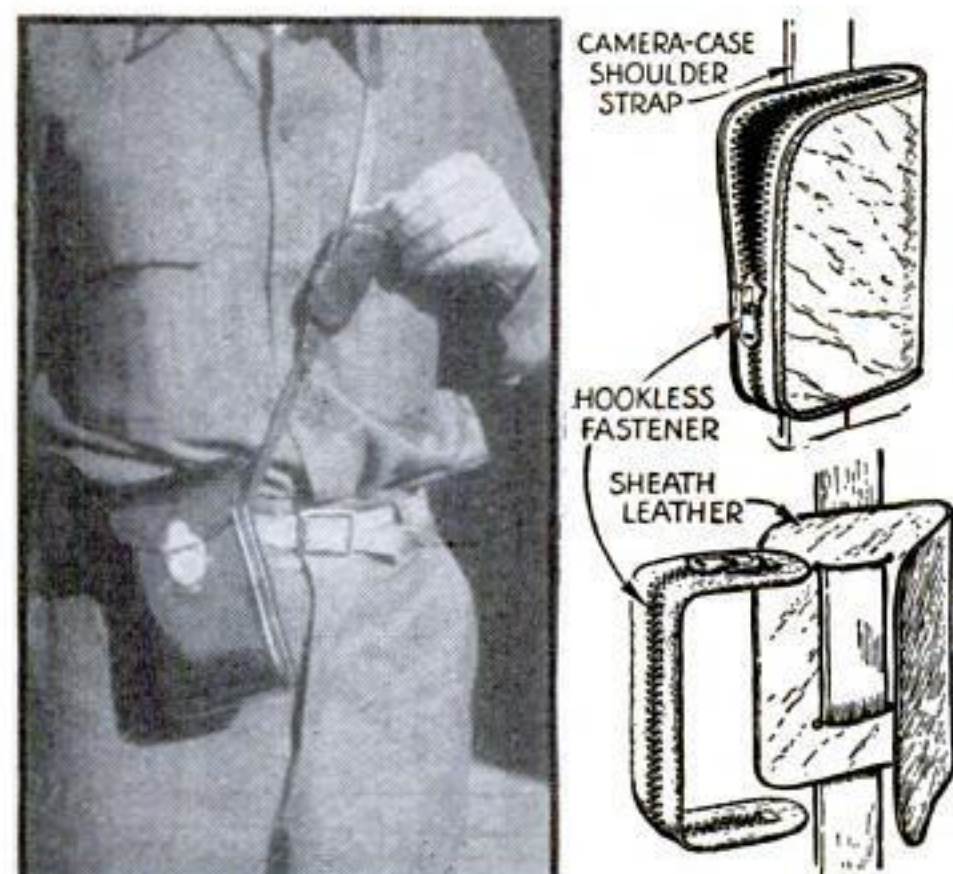
Insert a two-piece porcelain receptacle of the inclosed terminal type, and connect a length of rubber-covered drop cord. A feed-through tumbler switch is a convenience in turning the light off and on.—ARTHUR TRAUFFER.



Steps in making a lamp out of the kettle

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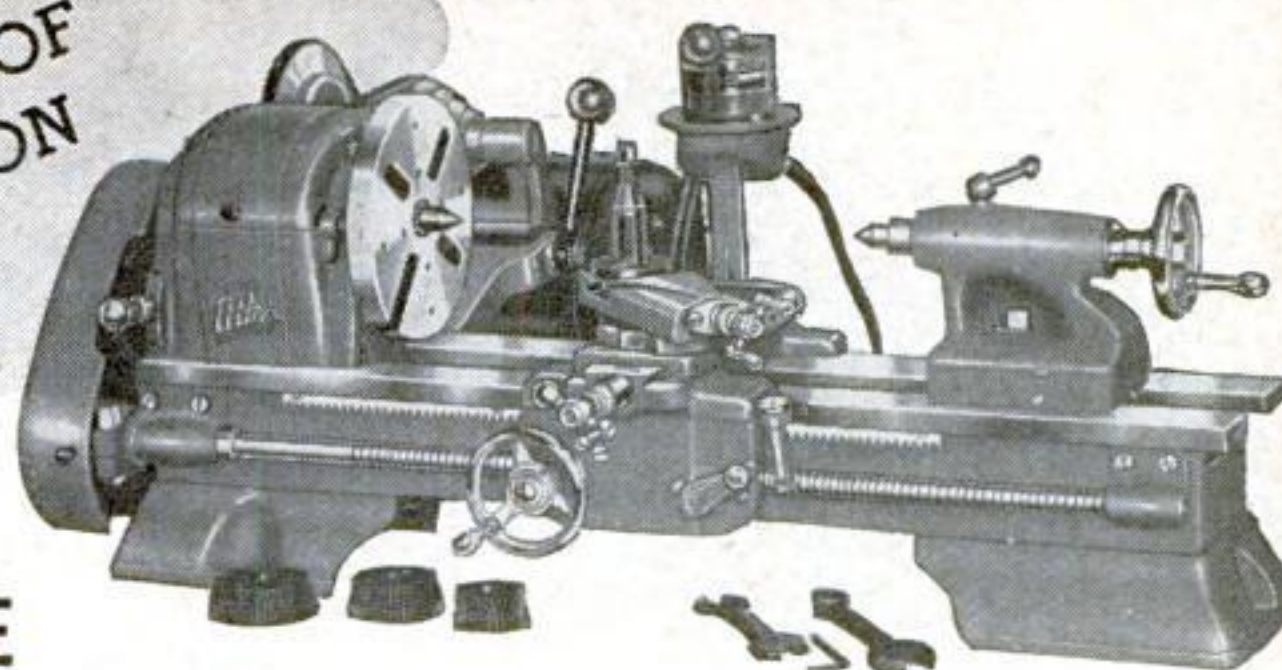


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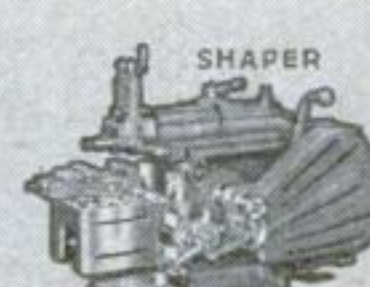
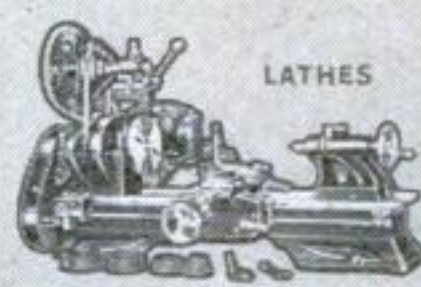
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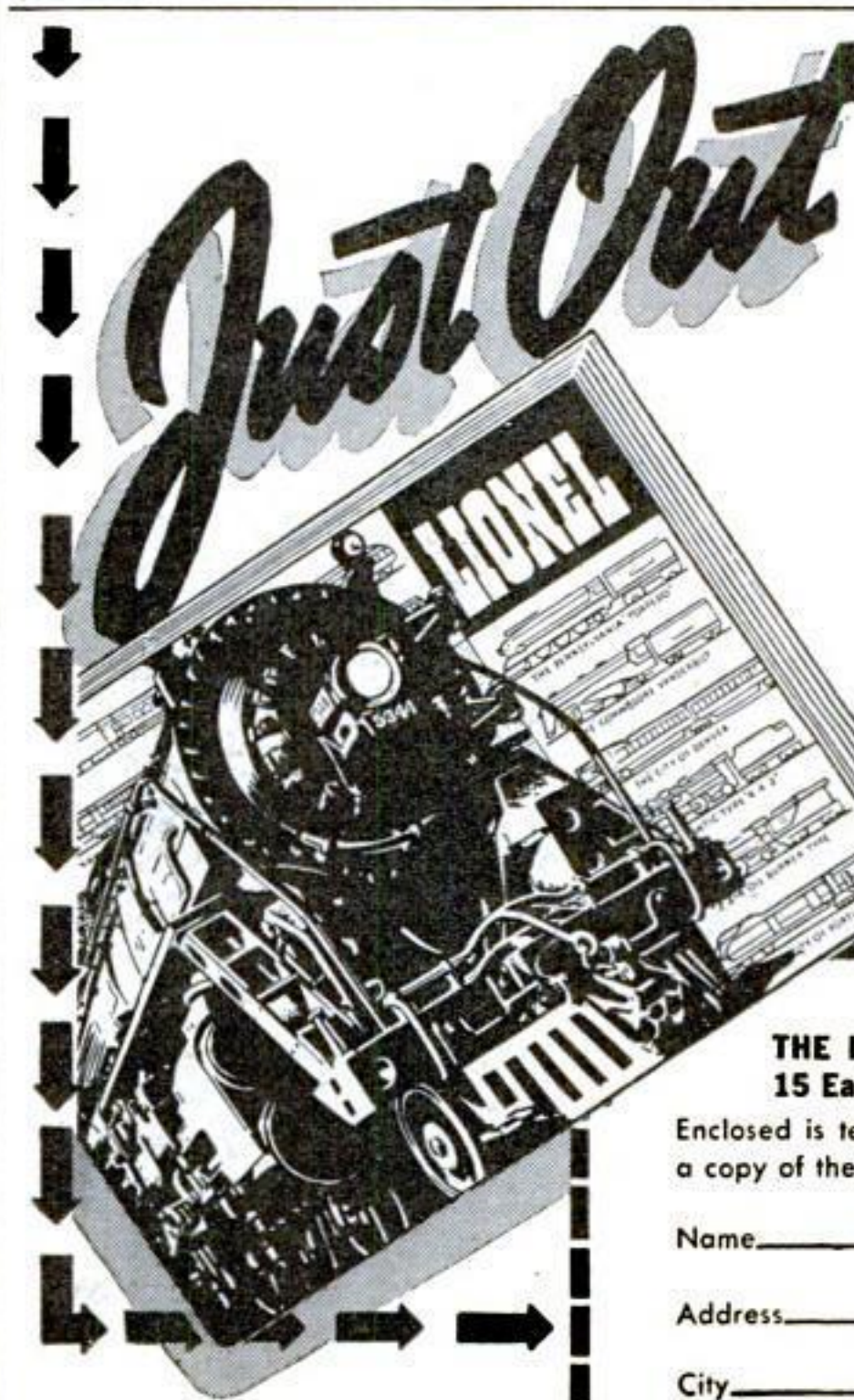
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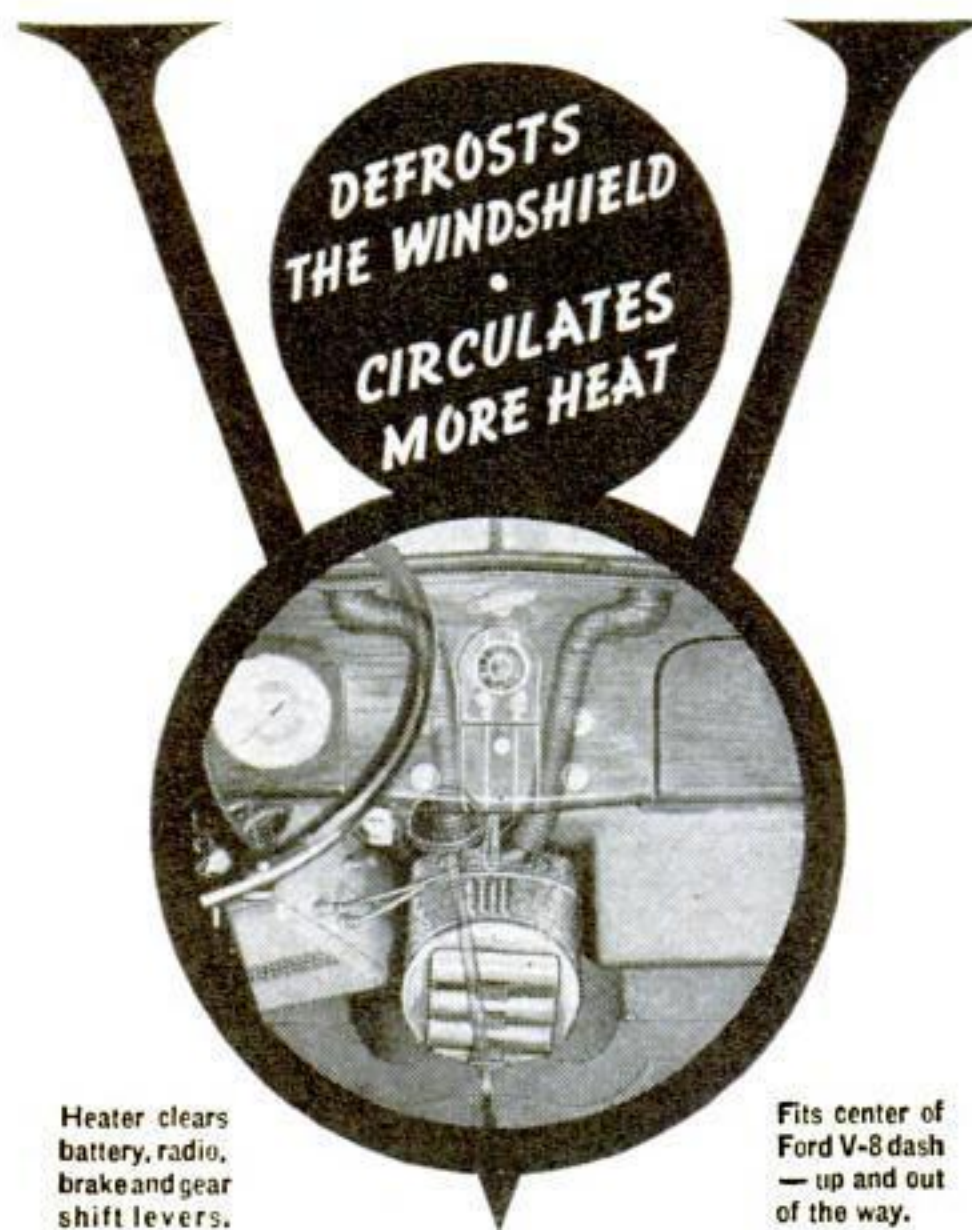
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War on Grasshoppers Halts Insect Invasion

(Continued from page 61)

were called in, and transported the sawdust to the plants by the carload; the truck convoys concentrated on carrying the mixed bait as it was sacked to the field where the war was on.

While this was going on, the great hatch in the Dust Bowl surged doggedly toward moisture; northward, toward the rich irrigated fields of the Arkansas Valley, where fine cantaloupes and other intensive truck and field crops are grown for national distribution.

MEANWHILE, farmers had been trying mechanical means of clearing their fields of hoppers. Airplanes had been used to spread poison, with only moderate success. Many "hopper dozers" were built. This device is a sort of skimmer of sheet metal drawn across a field by tractor, car, or team. As it scrapes the insects from standing crops, they slide across an apron of metal and into a pan where they fall into a bath of oil. Hoppers breathe through holes in their sides, and oil smothers them by sealing these openings. When the catch pan was filled, hoppers were skimmed off and burned. A morning's catch sometimes would result in piles as high as a man's shoulder.

One ingenious farmer built a hopper catcher that "harvested" the crop. A revolving paddle wheel swept the insects into a funnel, on into a length of stovepipe, and finally into a gunny sack. As a sack filled, the farmer's son tied it and tossed it aside, tying an empty sack in place for the next batch. These sacks have been hung up to dry for chicken and turkey feed during the winter.

Meanwhile, the hand-spread poison in the Dust Bowl area was fairly effective. People had to move out of the area because of the stench of the rotting insects. Roads were slippery and odoriferous from the number of hoppers smashed as tires ran over them. Still the hand-spreading of poison was falling short of fully arresting the march.

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(Continued on page 141)



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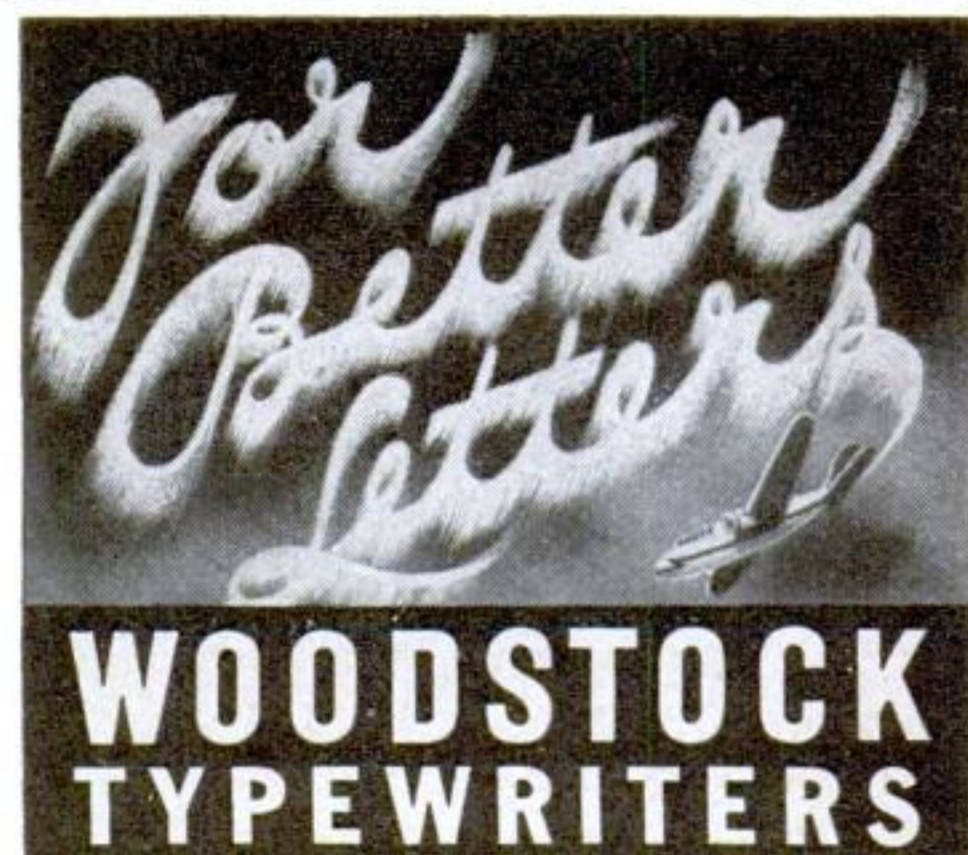
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Sturdy Steel Construction. Adds, Subtracts, Multiplies, Divides. Capacity, 999,999. 99. A real machine—guaranteed 5 years. On delivery, pay postman \$2.50 (plus few cents postage). (Foreign Countries send cash.) Your money back after 10 days trial if not satisfied. Thousands of satisfied users. Special Offer to agents.

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THE KELSEY Company; Y-33, MERIDEN, CONN.

War on Grasshoppers Halts Insect Invasion

(Continued from page 140)

because men fought the insect army.

The war still goes on. The migratory hoppers that hatched in the dust-storm area have grown wings. Recently, some seventy-five miles away, a rain freshened the grass range of the Huerfano Valley. Against the wind, as though they smelled grass, a part of these winged hoppers invaded the Huerfano. The concentration there rose from a normal local count to seventy-five to the square yard. Promptly the truck convoys began running the poison into that district in an effort to clean out as many as possible of the insects before egg-laying started.

THE scientists are continuing their studies, getting ready for next season's campaign. One move was to paint hoppers from different districts with different colors. The longest flight officially recorded, as this is written, is that of a hopper painted green near Springfield, Colo., and found later in Denver, 225 miles away. Five different states have reported finding marked hoppers. This shows why the migratory form is not merely a state or regional problem, but a problem for great areas.

On an experimental pasture, G. A. Hinkle, assistant to Sam McCampbell, has set up cages in which he keeps a constant number of hoppers. By watching what various concentrations do to vegetation within the screened areas, it is possible to estimate the damage done by various degrees of infestation, and by different species, each cage being allotted to one variety.

Considerable havoc has been wrought in the ranks of the hopper army. But there still are enough to lay eggs this autumn that will necessitate a new war in the spring. So the campaign is merely going into another phase as winter comes.

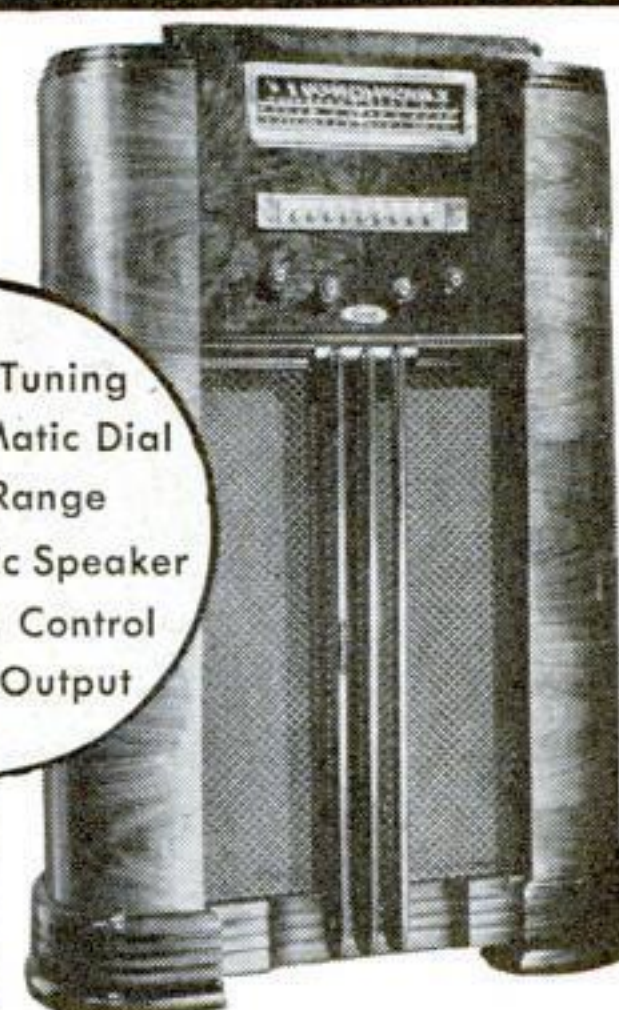
IF MOISTURE and cold both touch the eggs, they are destroyed. The fall campaign will consist of light harrowing of alfalfa patches, fence rows, and ditch banks to break the waterproof caps over the nested eggs. Cultivated fields will be plowed at a time when the eggs will be destroyed. The autumn census will be taken again, and if there is such a concentration as was found in the Dust Bowl, 1938 will see the human army again in action.

Some scientists have predicted that an era may come when mankind will have to battle for existence against the insect kingdom. Whether or not such fears are well founded, the fact remains that in Colorado, in 1937, for the first time an army was called out, military organization was put into effect, and a real battle was waged against an invading locust horde that threatened to lay waste uncounted acres of food crops. Science forecast the crisis, organized the campaign, and won a brilliant success.

THE Radio Leader

FOR 1938

- Electric Tuning
- Select-O-Matic Dial
- All-Wave Range
- 12" Dynamic Speaker
- Aut. Freq. Control
- 7 Watts Output



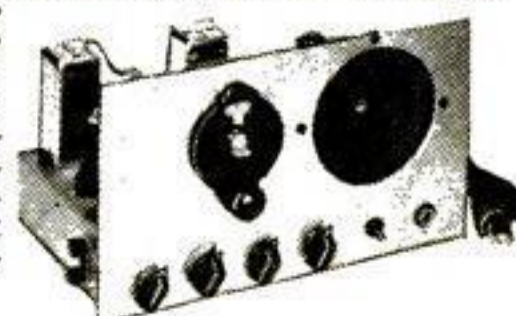
The Amazing KNIGHT II TUBE SUPERHET

1938's Radio Sensation—with every desirable new feature—at an amazingly low price. Electric Push-Button Tuning—press a button and there's your station instantly! Select-O-Matic 9 in. horizontal dial with all ranges in full view! Giant 12 in. Electro-dynamic Speaker for perfect tone! Tunes everything on the air in three full wavebands! Full 7 Watts Output! Double-tuned I.F.'s; R.F. Preselector; 3-gang Condenser; A.V.C.; Tone Control; etc. No other radio has all these features at so low a price!

See this new radio and 64 other new KNIGHT radios in the 1938 ALLIED Catalog. 5 to 16 tube models—for AC, AC-DC, 6 Volt, 32 Volt, Battery, and Auto operation. Radio's Outstanding Values!—Send coupon today.

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See the 32 new Build-Your-Own kits in ALLIED's new catalog. Kits from a Beginner's 1-Tube set to a 14-Tube All-Wave Superhet. We can supply matched kits of parts for building any set described in construction articles in any radio publication. Write for Free Parts Lists for building any Popular Science circuit: Beginners' All-Wave set; Wrist-Watch Radio; Cigar-Box set; Midget Radio; or any others.



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ALLIED's 1938 Catalog is Radio's Complete Supply Guide for everyone in Radio. P.A. Systems from 8 to 60 watts. Amateur Gear—all leading makes. Test Equipment for all radio servicing requirements. Parts—more than 12,000 exact duplicate and replacement parts for repairing or building any circuit. Books, tools, etc. 164 pages, packed with values. ALLIED's prices save you money—ALLIED's speedy service saves you time. Send coupon now for FREE copy of this new Catalog.



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Teeth That BITE!



The life of your saw—the work you do with it—what it costs and saves you—depends upon its **TEETH!** ATKINS Saws for wood or metal cutting, have teeth of "Silver Steel," the world's finest formula for saw steel. The best workmen always turn out better work with better tools.

GIVE ATKINS SAWS!

The ideal gift for any man or boy who makes things, is a genuine ATKINS Saw for wood or metal cutting. If you want to make a "lifetime" gift—just go to YOUR Dealer and—"Ask for ATKINS!" Atkins name on the blade means the best saw value you can buy.

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ATKINS
Silver Steel
SAWS



Send 10c for the "How-To-Do-It" Book. Tells how to plan Your Shop layout, how to make wood joints and furniture, how to cut metal and where to get 625 plans.

E. C. ATKINS & COMPANY
428 S. Illinois St., Indianapolis, Ind.

ABC Home Experiments for Amateur Chemists

(Continued from page 107)

You often have seen magazine advertisements that appeared to be printed in gold ink. Of course, the material is not really gold, and with the aid of your chlorine apparatus you can find out just what it is. Wet some strips of paper bearing the "gold" printing and place them in the test flask. Pass a little chlorine gas through the apparatus, and you will see the metallic ink change from gold to a greenish color. After a minute or so, disconnect the flask, add about half a fluid ounce of water, shake the flask well, and then add some household ammonia. The deep blue color that forms shows that copper is present. From this telltale test you may infer correctly that the "gold" is actually brass, an alloy containing copper.

YOU can produce magic writing without ink upon a blank sheet of white paper which previously has been treated with a special solution. Dissolve several grams of sodium iodide or potassium iodide in about two ounces of water, and add to this a solution made by boiling half a gram (or an amount half as large as a pea) of ordinary starch in a fluid ounce of water. Stir the mixture well, and brush it over the paper where the magic writing is to appear.

Place the damp sheet of paper upon a flat metal surface such as the bottom of an old cake tin, a sheet of galvanized iron, or a large sheet of metal foil. This metal backing should be connected to the negative terminal of a battery of two or three dry cells wired in series—that is, with the center binding post of one cell connected to the rim binding post of the next, and so on. Connect the nail or other sharp-pointed metal instrument that you will use as a writing tool to the positive terminal of the set of dry cells.

Now you can write with the nail, merely by touching it to the paper, and blue-black lines appear wherever it is drawn across the surface. The stunt becomes particularly mysterious-looking if you conceal the wires.

WHAT happens is that the electric current breaks down the sodium or potassium iodide, releasing free iodine, and the iodine reacts with the starch to produce the blue-black coloration. The paper must be moist for the experiment to succeed. You can perform it with a toy-train or bell-ringing transformer, instead of the dry cells.

You have noticed the milkiness of water just drawn from a faucet into a glass, and the fact that the milky appearance disappears in a few seconds. Of course, it does not impair the quality of the water for drinking. The cloudiness is due merely to the release of air dissolved in the water, in the form of tiny bubbles. Even clear water still contains much dissolved air; in fact, fish would die of suffocation with-

(Continued on page 143)

IT'S FUN TO DO MAGIC!

AMAZE AND MYSTIFY—LEARN TO ENTERTAIN
Hundreds of Tricks require no skill. You can do them. My famous "Book of 1000 Wonders," new enlarged edition, over 500 illustrations, describes Tricks for Pocket, Parlor or Stage. With each copy you get "50 Mysteries of Magic," which explains how to do many baffling stunts without special apparatus. Both books, bound under one cover, postpaid for 10c. Write today!

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Triple Objective
Brownscope "Professional" \$8.50

The new super-power 100X to 600X Brownscope. Substantially and precisely made. Heavy tilting base. Large concave mirror. Rack and pinion focusing with two adjusting wheels. Carefully tested optical system. Power 100X to 600X in six steps. Dustproof 3 objective revolving nosepiece. Chromium plated tube and machined parts. Comes complete with wood carrying case, slides, instructions, and elaborate 6 piece set of dissecting instruments mounted in carrying case. Only \$8.50 postpaid. Catalog of Telescopes, Microscopes, Binoculars, FREE on request. Address Dept. 612.

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Send for Catalog all Ideal's new Models. 10¢ IDEAL AEROPANE & SUPPLY COMPANY, INC. 28 West 19th Street, New York

ABC Home Experiments for Amateur Chemists

(Continued from page 142)

out it. You can measure for yourself the surprising quantity of air that water contains, with a simple piece of apparatus—an ordinary wash bottle.

No home laboratory should be without this important accessory, constantly useful for washing precipitates or dispensing small quantities of water. To make a wash bottle, a flask or bottle is fitted with a two-hole stopper. One hole carries a piece of glass tubing, bent in a flattened V, through which the breath is blown. The second hole carries another bent section of tubing, with one end extending to the bottom of the bottle and the other commonly ending in a drawn-out nozzle, through which water is blown from the bottle into a test tube or filtering funnel.

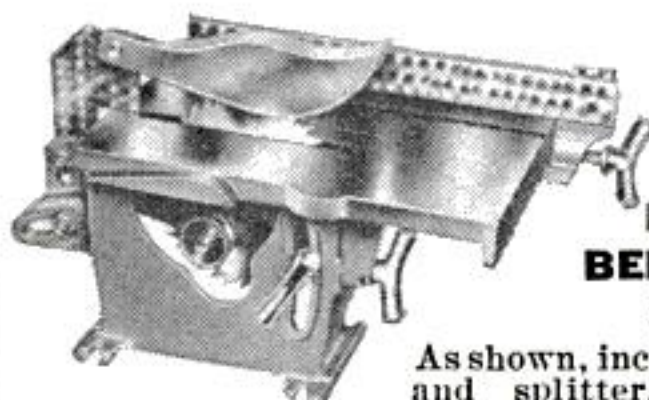
FOR the air-in-water test, remove the blowing or mouth tube from the wash bottle and plug the hole with a cork stopper. Fit a length of rubber tubing, about two feet long, to the other tube, after removing the nozzle or tip. Fill the entire flask and the rubber tubing with water, and let the end of the rubber tubing dip in a beaker of water. Then place the wash-bottle flask in a coffee can and surround it with water.

By heating the coffee-can water bath to the boiling point, and keeping it boiling for half an hour, you can drive the dissolved air out of the water in the flask. You will see the air escaping during the heating, and finding its way up into the neck of the flask, where it is trapped. Meanwhile, the heat makes the water in the flask expand, and some of it overflows into the beaker of water, which acts as a seal to prevent outside air from entering.

When the flask and the water have cooled to room temperature, after the heating, you will be able to see the quantity of air that the water originally contained. This will be equal to the water displaced from the neck of the flask. You can measure the volume of the air by tying strings around the neck of the flask, one at the original level of the water in the neck and the other at the new level. Then see how much water it takes, from a graduated cylinder, to raise the level of water in the flask from one string to the other.

YOU also can note the original volume of water used in the experiment, which is the total amount that it takes to fill the flask up to the upper string. Thus you can calculate the percentage of air, by volume, that the water contained. Suppose you find, for example, that you used 260 cubic centimeters of water, and, by heating, obtained just four cubic centimeters of air. Multiply the latter figure by 100, and divide the result by the former figure, and you will obtain the percentage. In this case, it would be just over one and one-half percent.

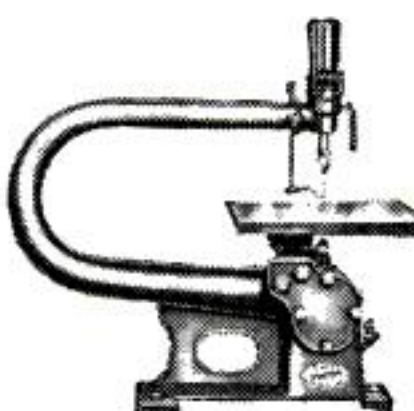
GIFTS OF POWER TOOLS ENGINEERED TO LAST



**B575 7"
BENCH SAW
\$12.35**

As shown, including guard and splitter, steel rip fence and mitre gauge.

A Driver bench saw will relieve any home craftsman of much of his hardest work. The 7" blade on this tool cuts stock to 2 1/4" thick. 14" x 10" ground cast iron table tilts to 45°, permitting angle cuts. Saw arbor raises and lowers. Heavy steel ripping fence. Safety guard with splitter which facilitates sawing of green or damp lumber.



**J505
14" JIG SAW
\$13.45**

As shown, including pulley on machine. Motor pulley and belt extra.

Complete in itself for a great variety of creative work, this jig saw is built to give hour after hour of vibrationless, trouble-free performance. It has cast iron tubular frame with throat capacity of 14". Table 9"x9" tilts to 45° and has accurate quadrant indicator. Enclosed drive mechanism lubricated by splash oil system. Plunger-type blower clears cutting line of sawdust.

For the beginner or veteran tool user, an inexpensive, precision-built Driver tool makes the ideal gift. Note the features on tools shown here. Proof that home craftsmen everywhere are right when they say, "Driver gives a lot of tool for the money!"



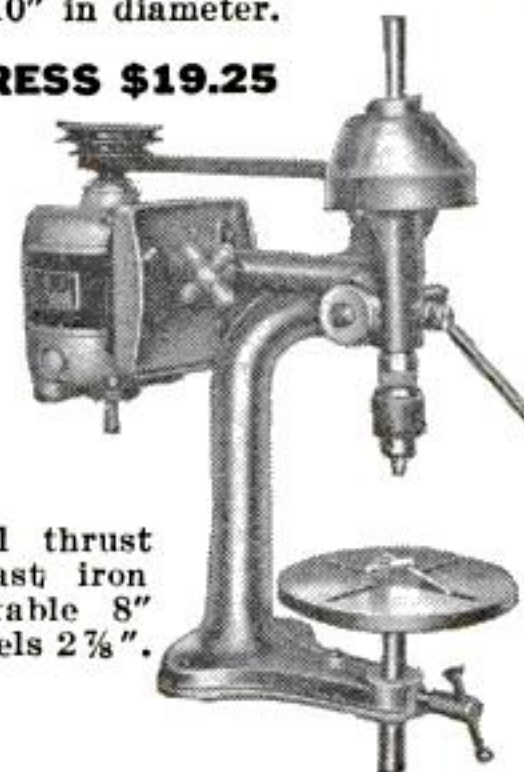
**L540
GAP BED LATHE \$18.50**

As shown, including 3/4" V-belt and box wrench.

This low priced tool will handle the bulk of wood and plastic turning and metal turning jobs in the home workshop and do them well. It has sturdy cast iron gap bed 44" long and 3 1/2" high. Morse Taper centers, bronze bearings, ball thrust bearing in head. Capacity: work 30 1/2" long, discs 10" in diameter.

D570 DRILL PRESS \$19.25

As shown, less motor. Includes Jacobs Key Chuck, belt and motor pulley.



Here's a superior drill press unique in its price class. It has a Jacobs (1/16" to 1/2") Key Chuck. Bronze bearings and ball thrust bearing. Rigid cast iron frame and adjustable 8" table. Spindle travels 2 1/2". Four speeds.

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DO your own simple home, auto and motor-boat repairing and be independent of outside repair men. You will avoid delays, save much money, and have the satisfaction of knowing that the work is well done.

The booklet contains clear diagrams and directions for correct procedure for hundreds of common jobs, and enables any home worker to get dependable results, *easily*, on any of the following:

Stopping leaks in pipes, heaters, boilers, tanks, radiators, air ducts, smoke pipes, pails, etc., at connections, seams, cracks, rivets or holes.

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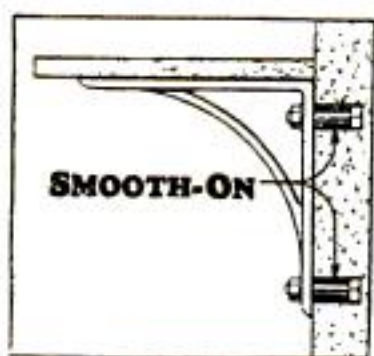
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Making waterproof joints at skylights, roof cracks and flashing.

Making wet cellars dry from the inside, making concrete floors hard, water and oil proof, and non-dusting, making masonry walls waterproof.

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BENJAMIN AIR RIFLE CO., 853 Marion St., St. Louis, Mo., U.S.A.



Flying Lifeboats Make Daring Rescues at Sea

(Continued from page 57)

with floating units, these planes have been instrumental in saving many lives and in bringing swift relief to suffering humanity, both on ships at sea and in isolated communities on lonely islands or along outer beaches.

Their high speed and broad range of vision enable them to bring under observation a thousand square miles of sea and shoreline within a brief space of time, affording great aid to surface craft endeavoring to locate vessels in distress. Such crafts may be sighted readily from the air, and their position given by radio, so that cutters and patrol boats are saved many hours of search.

WORD was received at the Miami, Fla., station recently, that a boy had been swept out to sea in an open skiff, near Cape Canaveral, 200 miles north of Miami. Within a few minutes, a seaplane had been dispatched on its errand of mercy. Early that afternoon, it arrived off the cape and began the search, finally locating the skiff thirty miles from shore by flying a series of rectangles. The seas were much too high for landing safely on the water, so the plane flew in widening circles, in an effort to find some ship that could be sent to the rescue. However, the nearest was eighty miles away.

It was apparent that if the boy was to be saved, he must be picked up before darkness came on. The wind was increasing and the skiff filling with water. The pilot of the plane knew that to land on the water meant an almost certain crack-up, although the hull of the plane would float.

True to service tradition, the pilot made his decision, and down went the plane to a landing near the skiff. The boy was taken aboard, unharmed, but the wings of the plane were so badly damaged that a take-off was impossible. All that night the plane drifted over the rough sea, until a fortunate shift of wind set it in toward shore. Early the next morning it reached the beach, and was located by a searching party.

A valuable plane was practically wrecked, but one more life had been saved by the Coast Guard!

POWERFUL radio equipment keeps each station in direct communication with the planes, as well as with floating units at sea. In addition to the standard installation on the planes, each is provided with a radio direction finder, by means of which the plane can be guided accurately to any vessel equipped with radio, or any transmitter ashore.

For example, the radio operator on the plane out of Salem, Mass., Harbor tunes in on station WAAB in Quincy, and then slowly swings the loop antenna until it is trained on the

(Continued on page 145)

Easy NEW

Improved CONQUEROR

World's largest manufacturer announces sensational improvement in Band Instruments. New patented VOCABELL revolutionizes tone effects. Easier to play. You'll develop talent fast with these new Conns. Choice of world's greatest artists. See your dealer or write today for FREE BOOK and home trial, easy payment offer. Mention instrument.

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Waterproof Your Own Save up to \$100 to \$150

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POCKET SLIDE RULE

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Big Demand! Good prices the year round! Nation-wide markets waiting for all you can ship. WE BUY! Sell to us also. Breed or lay 20,000 eggs yearly. Get ready now for next spawn. Free book shows sketch. MEN & WOMEN see what others are doing. Send no money. Just your name-address on postcard brings special offer to beginners.

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DREMEL MFG. CO.
1124 CT. Racine, Wisconsin

Flying Lifeboats Make Daring Rescues at Sea

(Continued from page 144)

station. From the position of the loop, the bearing is read, and the pilot is enabled to fly a true course toward the transmitter of WAAB. This form of navigation is positive and can be utilized with any broadcasting unit in the world, within receiving range.

The radio direction finder recently brought about hospitalization of an insane man found swimming in the Atlantic 160 miles out from Boston. Lieut. T. G. Miller was taking life easy one Sunday morning when this message flashed into the Salem station from the commander of the Boston division:

"Trawler *Ripple* picked up apparently insane man in water. Proceed and take off man."

Shortly, Miller took off with a crew of three in the amphibian *Canopus*, heading out to the reported position of the *Ripple*.

FOG hung over the ocean, and a heavy sea was running. The pilot knew that a landing and take-off on the rough water would endanger the plane. Time was essential, as the swimmer was fighting his rescuers violently, so Miller instructed the *Ripple* to continue transmitting signals, and the direction finder on the plane led the pilot on a straight course to her, where she lay, hove-to on the shoals.

The plane was brought down safely near the trawler, and the man placed in the cabin and secured from self-injury. After a successful take-off, he was landed at the Boston airport, and admitted to a hospital within two hours after his transfer from the *Ripple*.

Seemingly little things sometimes lead to hasty rescues. William O'Neil of New Bedford, Mass., cut a boil with a rusty razor blade, and resumed his fishing aboard the *Mao IV*. Four days later blood poisoning set in, and O'Neil's condition quickly became critical, his right side having become paralyzed.

Across the continent, another rescue saw a twin-engined plane wallowing in heavy seas as it taxied twelve miles with two nearly drowned boys taken from a capsized boat in the breakers off Mission Beach.

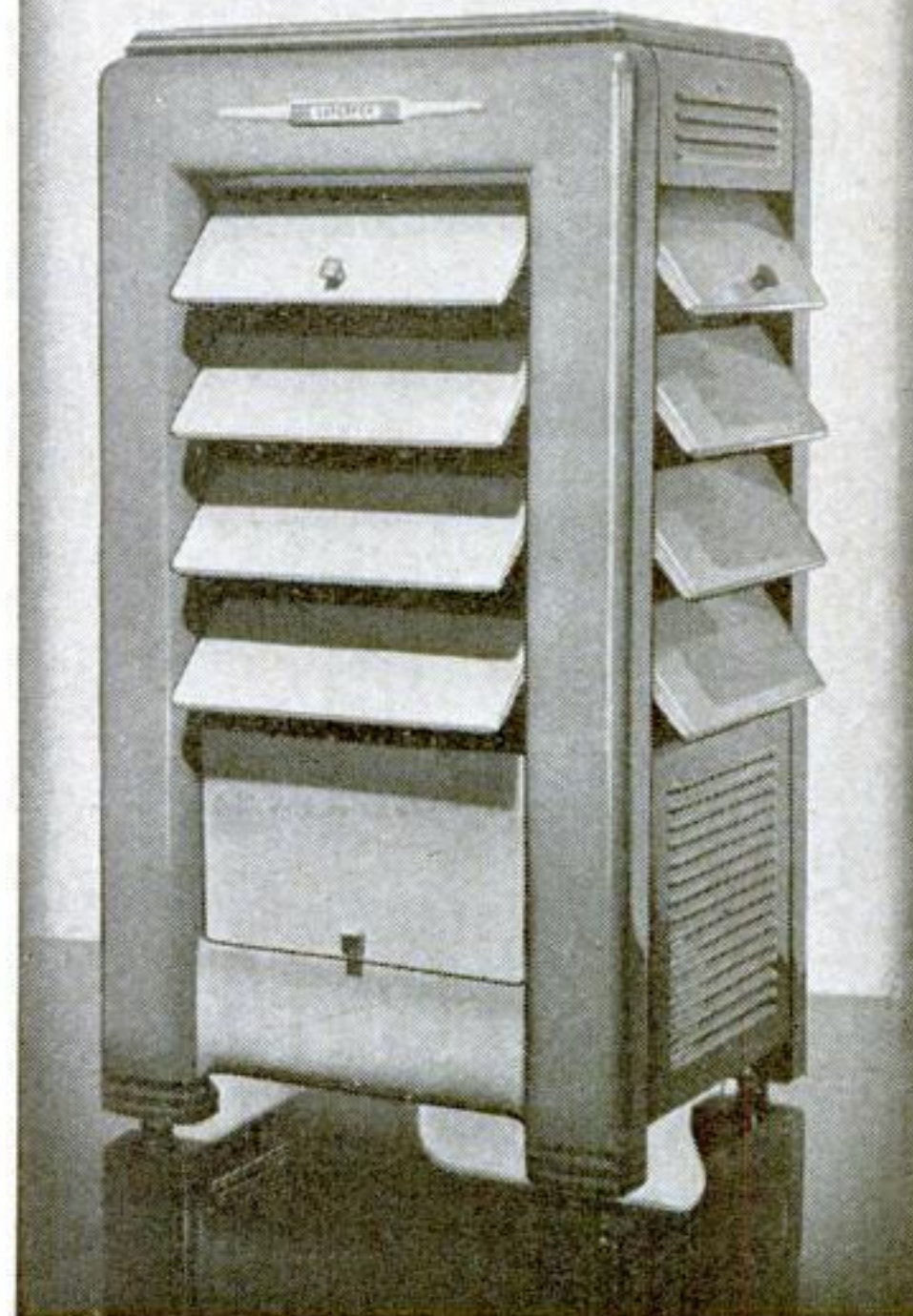
VICTOR Robinett and Owen Key were swept into the Pacific through the mouth of Mission Bay in a motor boat by a strong out-going tide. After a lifeboat attempting a rescue had overturned four times in the heavy ground swells, a call was flashed to the Coast Guard for help. Only a few minutes later, Lieut. Linholm was flying low over the breakers, while Lieut. A. H. Hesford spoke words of encouragement from the new "voice from the air," a portable speech amplifier which hangs from a bracket at one side of the plane. This is the guard's newest life-saving aid, through which directions

(Continued on page 146)

4 QUESTIONS TO ASK WHEN YOU BUY A STOVE

Will it

- 1 Circulate heated air like a warm air furnace?
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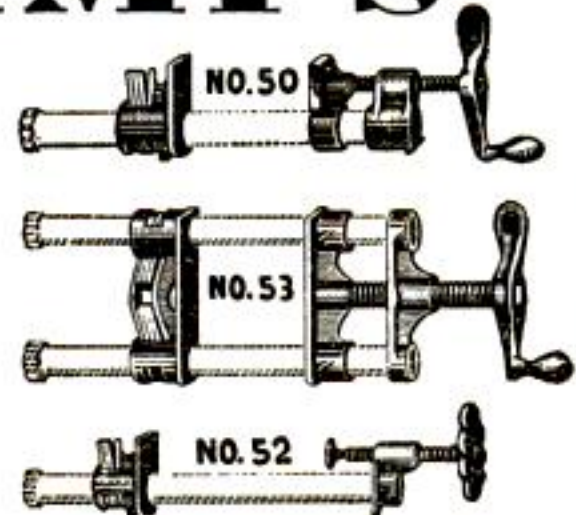
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CATALOG ADJUSTABLE CLAMP CO. FREE
"The Clamp Folks"
353 N. ASHLAND AVE., CHICAGO, U. S. A.

Flying Lifeboats Make Daring Rescues at Sea

(Continued from page 145)

are given for maneuvering small boats, and encouragement is shouted to persons in danger.

"Hang on, boys, we're coming," boomed the voice repeatedly as Linholm taxied up and Hesford climbed out on a wing to fling a line to the capsized runabout.

Once he had the boys aboard, Linholm turned the ship out to sea and, in the face of towering breakers, taxied twelve miles around Point Loma into San Diego Bay before he could pull the glistening hull free from the water and take to the air for a speedy flight to headquarters at Lindbergh Field, San Diego.

"What's the chief danger of such a flight?" I asked Linholm while riding with him on a training flight over the Pacific the other day.

"Engines coming out," he replied. "Twice, amphibians on the Atlantic have lost engines when coming down to a hard landing in rough seas. Fortunately, in the Mission Bay rescue we landed on what we call 'sea six'."

THE Coast Guard, it appears, classifies the state of the sea according to number, from zero to nine. Zero is glassy calm. No airplane and few small boats could remain afloat on the storm-lashed surface which qualifies for nine. Six is rough enough to win recently for Linholm and Hesford, together with Chief Pharmacist's Mate T. A. Montgomery and Radioman J. E. Rieley, Congressional Medals, "in testimony of heroic deeds in saving life from the perils of the sea," for their rescue of the two boys.

Sometimes the rescuers lose their lives. From St. Petersburg, Fla., Lieut. Charles M. Perrott took off in an amphibian to search for two boys, lost in a small launch during a heavy blow the preceding night. Perrott found the boat and signaled for a crash boat to render assistance. While he was circling the bay a few minutes later the plane was caught by a hurricane and crashed, killing pilot and crew instantly.

Soon the Coast Guard will be flying in tougher weather and landing on rougher seas than in the past. Six new twin-engine patrol flying boats capable of 2,000-mile flights will extend the range of service. With these ships, pilots can land on a "sea eight."

"LANDING," as Linholm explained, "is far easier than taking off. One bounce into a big wave and you stop. You may hit a dozen before pulling an amphibian into the air."

The thrilling story of aerial rescue has scarcely begun. Pilots may tell in coming months of aid rendered 1,000 miles at sea by these shore-based lifeboats of the sky. That will constitute only another chapter in the development of the Coast Guard.

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For 10 days' free inspection of policy, simply send name, age, address, beneficiary's name and relationship. No application to fill out; no medical examination. After reading policy, which will be mailed to you, either return it or send \$3.65 which pays you up for a whole year—365 days. Write National Protective Insurance Co., 419 Pickwick Bldg., Kansas City, Mo., today while offer is still open.

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Statement of Ownership, Management, Circulation, etc., required by the Act of Congress of March 3, 1933, of Popular Science Monthly, published monthly at New York, N. Y., for October 1, 1937, State of New York, County of New York, ss. Before me, a notary public in and for the State and county aforesaid, personally appeared A. L. Cole, who, having been duly sworn according to law, deposes and says that he is the Business Manager of Popular Science Monthly and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in Section 537, Postal Laws and Regulations, printed on the reverse of this form to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are Publisher, Popular Science Publishing Co., Inc., 353 Fourth Avenue, New York, N. Y.; Editor, Raymond J. Brown, 353 Fourth Avenue, New York, N. Y.; Managing Editor, Raymond J. Brown, 353 Fourth Avenue, New York, N. Y.; Business Manager, A. L. Cole, 353 Fourth Avenue, New York, N. Y.
2. That the owners are: Popular Science Publishing Company, Inc., 353 Fourth Ave., New York, N. Y.; Stockholders of Popular Science Publishing Company, Inc., Mansell and Company, 45 Wall St., New York; Alice A. Fisher, Greenwich, Conn.; Oliver B. Capen, Bedford Village, N. Y.; Noreen S. Capen, Bedford Village, N. Y.; Robert Cade Wilson, 683 Springfield Avenue, Summit, N. J.; Ada B. Wilson, 683 Springfield Avenue, Summit, N. J.; Marguerite N. Cole, Valley Road, Plandome, L. I., N. Y.; John Nichols, 353 Fourth Avenue, New York, N. Y.
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(Signed) A. L. Cole, Business Manager.
Sworn to and subscribed before me this 29th day of September, 1937.
Esther Eyl, Notary Public, Kings County Clerk's No. 43, Registry No. 8040. New York County Clerk's No. 98, Reg. No. 8F55.
(Seal) My Commission expires March 30, 1938.

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Stamp Detective Solves Mysteries

(Continued from page 51)

isms function exactly alike. Their parts wear out differently. They are set with different tensions. They operate under different conditions of heat and moisture. They clip off the stamps in distinctive ways. Their teeth leave marks on the gum which, under a microscope, "fingerprint" them.

Each year, the number of such dispensing devices in use is increasing. Del Witt believes a development of the future may be machines which will place a distinctive mark or number on every stamp they deliver to aid in tracing senders of criminal letters.

EVEN when stamps are not obtained from vending machines, Del Witt has found, they may contain clues that a skilled observer can detect. Clerks in stores and post offices, for example, tear up sheets of stamps mechanically without giving thought to how they do it. From force of habit, some clerks always tear the sheets vertically, others horizontally.

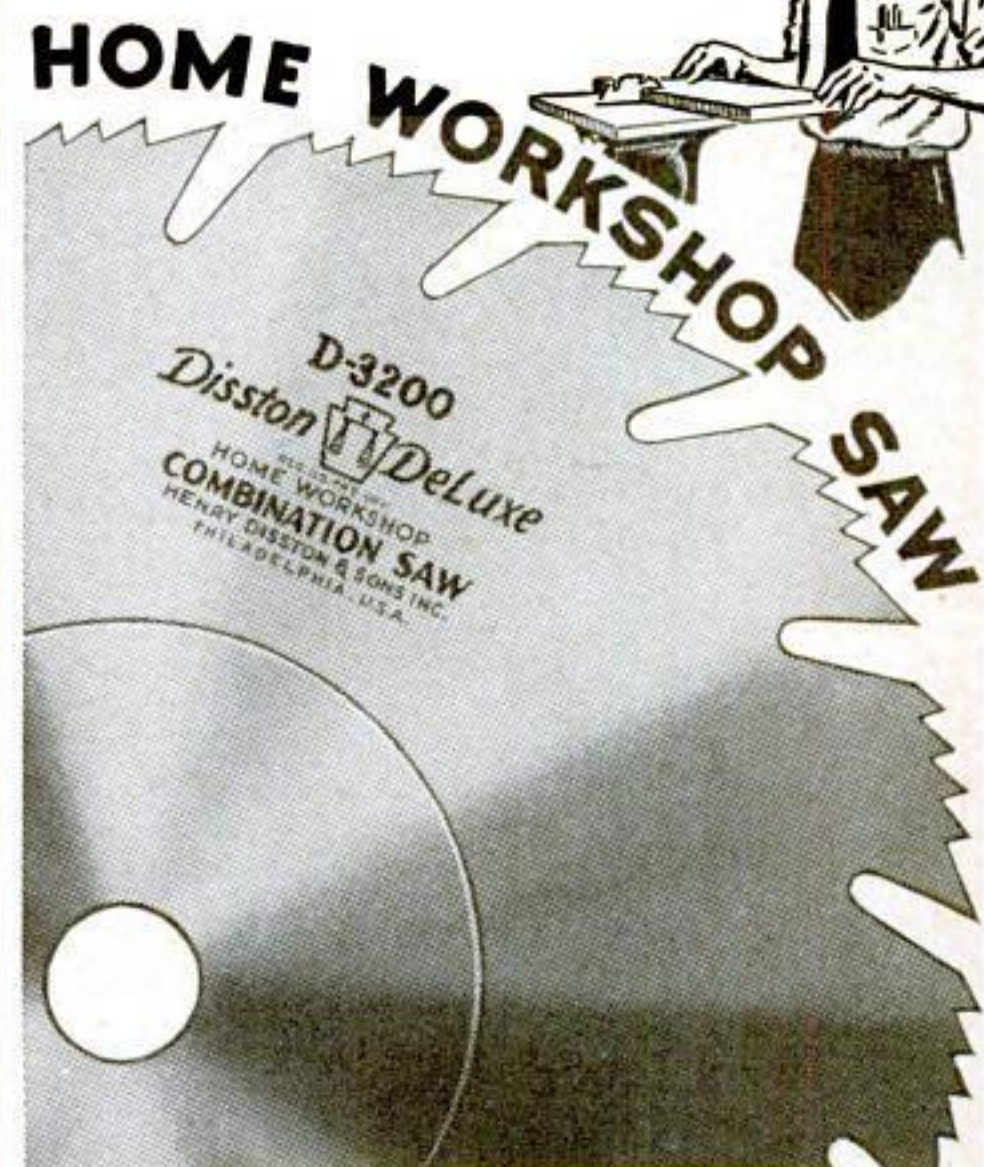
One of the laboratory aids which the stamp detective has developed is an original apparatus which illuminates the pieces of paper with light projected through them. Even the tiniest variation in a stamp—a microscopic scratch on George Washington's eye, or the faintness of the bar across the "C" in a cent mark—may provide the needed clew. Such differences help trace stamps to given engraving plates and places of sale.

Twice, in recent months, Del Witt has come to the aid of friends. Not long ago, a tenant in an apartment house moved out leaving a large bill unpaid and taking the key to the apartment with him. Later, the key was returned by mail. The landlady appealed to Del Witt. He examined the stamps on the envelope, comparing them with others in his collection. They might have come, he found, from either of two neighborhoods. The woman made inquiries in both areas, and discovered her former tenant living in a wealthy man's home where he was employed as chauffeur.

ON ANOTHER occasion, the cashier of a local bank sought Del Witt's help. One of the patrons had sent in some money by mail, neglecting to enclose a deposit slip or to put a return address on the envelope. Through the stamps, Del Witt traced the letter to a certain section of the city. This tip enabled the bank official to find the unknown depositor, an elderly spinster, and to credit the money to her account.

Eventually, Del Witt believes, police departments in every large city will build up accurately catalogued, up-to-date files of all the stamps sold in the various zones. Such collections would enable trained stamp experts to give invaluable assistance in the solution of crimes.

DISSTON FINEST



● Times change! Homecraftsmen, like mechanics, are buying the best saws made. The thriftiest home workshop circular saw is Disston De Luxe. On any job, it means easier cutting. It gives a lifetime's satisfaction.

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DeLuxe Hollow Ground Combination

6" (1/2" hole), \$4.30 8" (1/2", 5/8", 3/4" hole), \$5.40
7" (1/2" hole), \$4.90 10" (5/8", 3/4" hole) ... \$6.90



Above. D-23 Disston. One of the finest hand saws. Lightweight, straight back, narrow blade. Easy running, fast-cutting. Beautiful finish, 26" length, \$3.85

Below. D-8 Disston. Famous, world around, as the "Saw Most Carpenters Use." Wide blade. Skew back. Same in narrow blade for home workshop. 26" length ... \$3.50

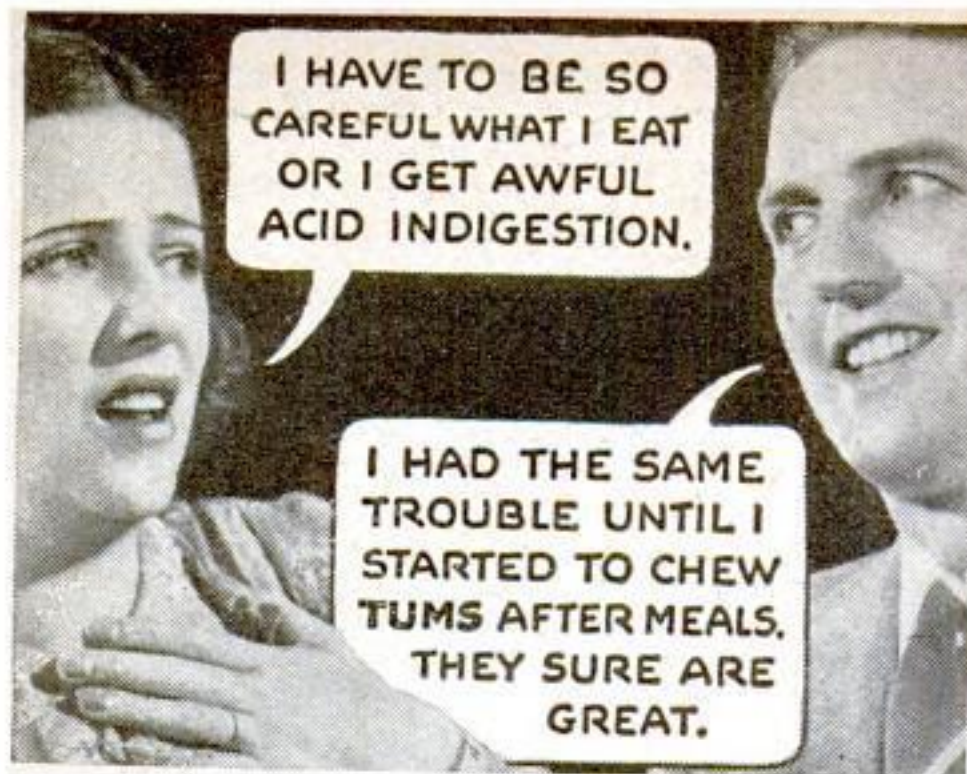
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MOTOR with flywheel

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TRAILER SUPPLY CO., Box 438-B, WAUSAU, WIS.

Driving a Car by Ear

(Continued from page 72)

good. Or they may only howl in very dry weather, or when you get them soaking wet. The important thing is whether the noise keeps up, or whether it comes only once in a while and then disappears. The same thing applies to chattering brakes, because a chatter and a howl are about the same thing. Both are vibrations caused by some particular condition of the brake lining and the brake drum—usually a glazed surface on the brake lining. A long run down a mountain with the brakes partly on may put a temporary glaze on the surface, but it will disappear after a few quick stops. Of course, if the car has seen many thousands of miles of hard service, and the brakes suddenly begin to chatter or squeal continually, they ought to be checked right away."

"ARE there many other noises I'm likely to hear that don't mean real trouble?"

"Sure, plenty of 'em," Gus replied, as he put the end of the hose back on its hook. "Sometimes, on a cold morning, while you're letting the motor warm up a bit, you may hear a sputtering, gurgling noise from under the car. Don't let it worry you. It'll be water, condensed from the exhaust fumes in the muffler, being forced out the vent hole. If you see a small puddle of water on the floor after you drive the car out, that's probably where it came from. Then, if you hear a 'slap, slap, slap,' noise when you drive onto a smooth concrete road from a dirt road or from your own bluestone-covered driveway, it probably isn't a piece of the tire tread coming loose, but a small stone wedged into the tread. If the noise doesn't stop within a quarter mile or so, it isn't a bad idea to get out and investigate. There's always a chance that it's a nail or a piece of scrap metal.

"There's another noise that sounds like trouble but doesn't mean much," Gus continued as he directed a golden stream of oil into the filler hole. "That is a sort of a ticking rattle that comes from one of the wheels just as the car stops. It's a lot like the sound we used to get from a loose demountable rim in the days when cars had such things. But, while a loose rim in the old days might mean a tire coming off on the road, the noise you hear nowadays means only that the large snap-on cap over the hub of the wheel is a bit loose. If it fell off, you'd have to buy another one, but the operation of the car wouldn't be affected."

"HOW about some of the noises that are real danger signals?" Knowles asked, while the mechanic was rechecking the oil level.

"There's one that a lot of people don't listen for," Gus replied, "and that is the rather sharp click, accompanied

(Continued on page 149)

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Driving a Car by Ear

(Continued from page 148)

by a slight jar, that comes when you have backed and you let in the clutch to go forward again. If you hear that sort of a noise, you'd better check up on the tightness of the back wheels on the hubs. If a wheel is loose and is sawing back and forth against the key, the key may be sheared off and the wheel will be free on the shaft—which means a tow-in job. Or else the end of the shaft may snap off, and then you will be in trouble."

"SOMETIMES I hear a slight click if I don't have the motor going at the right speed when I let in the clutch after shifting gears," Knowles remarked. "Is that the same thing?"

"The click you hear then is mostly the taking up of the play—or, in other words, the backlash in the whole drive from motor to rear wheels," Gus explained. "You can get that sound in most cars, no matter how tightly the wheels fit."

"How about motor noises? Is it easy to learn to tell which noises mean that real trouble is coming?"

"How are you going to do that," Gus countered, "when most of the things that mean trouble coming to the motor don't give any warning noises? The noise comes after the damage is done. Take the oil supply, for example. If it fails and you don't happen to notice the lack of pressure on the gauge, or the increase in motor heat on the dash thermometer, then the first thing you know about it is when a heck of a lot of clattering and clanking tells you that a bearing is shot, or when the motor stops because the pistons stick. All that your ears can do is to tell you when something has gone wrong—not when it is about to go wrong."

"Now I think of it, I can see that it would have to be that way," Knowles admitted, "because the engine parts move at such high speed and fit so closely. As long as they fit, they can't make any funny noises—and when anything happens to make 'em loose, the damage is already done. Are there any other important things to listen for, outside of the motor?"

"WELL," said Gus, wiping his hands on a wad of waste, "if you hear a grating and grinding noise from a front wheel and you feel a slight drag on the steering wheel on that side, slow down at once and head for a repair station, because you've probably broken a front-wheel bearing."

Knowles climbed into his car and started the engine.

"Thanks a lot, Gus," he said. "I suppose this listening for noises is a necessary evil of motoring, eh?"

"It isn't for one of my customers, anyhow," grunted Gus.

"How's that?" Knowles asked. "Is he one of those 'I should worry' drivers?"

"He's just as fussy as you are—but he's stone deaf!"



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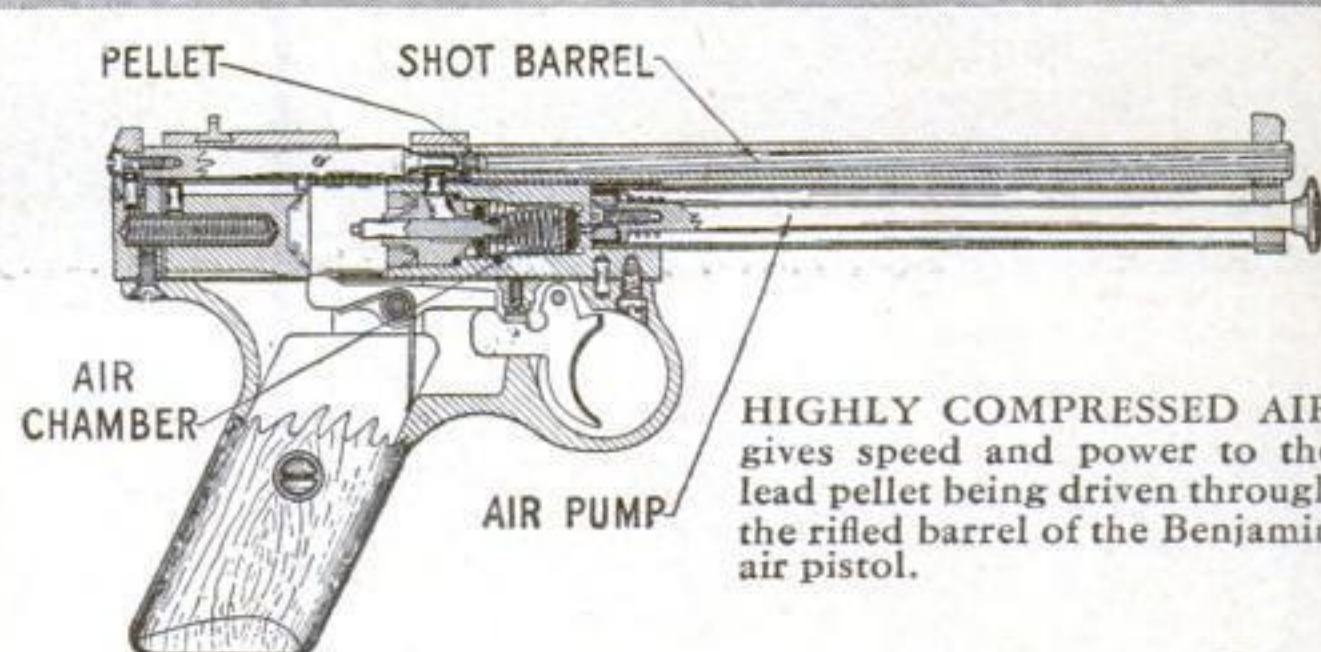
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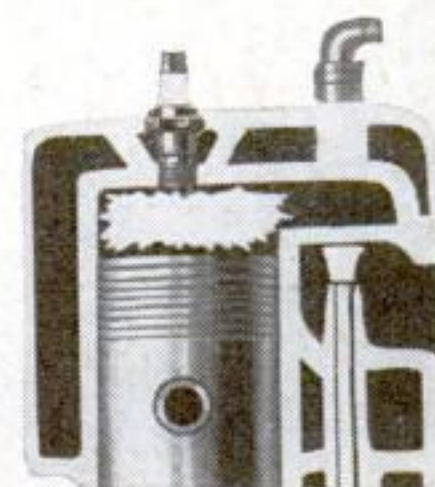


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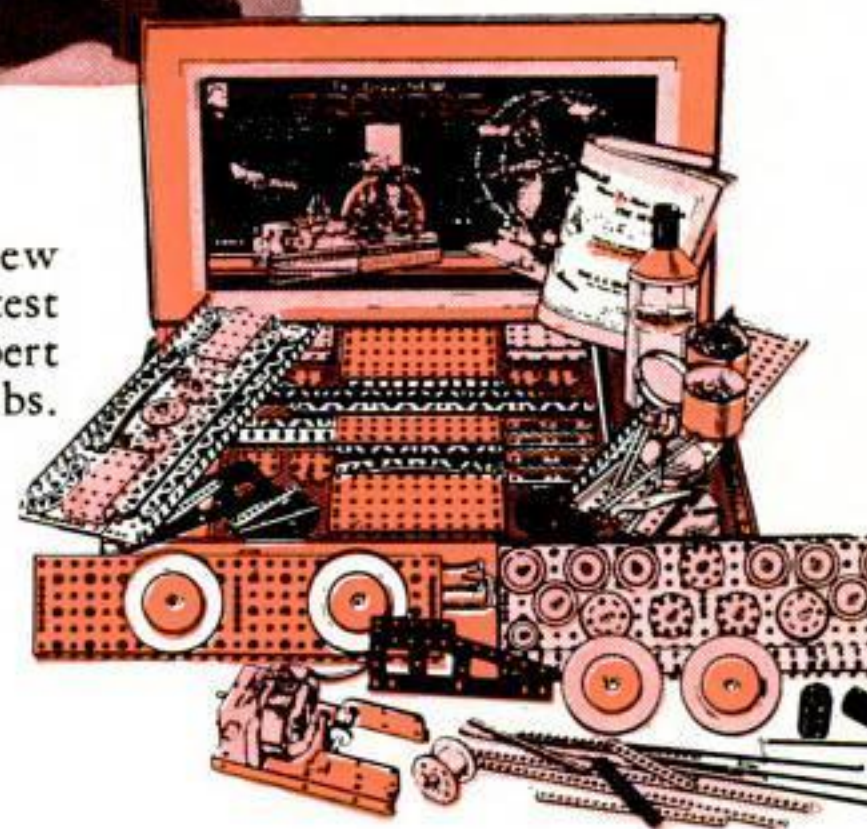
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